Service manual Leica M500 N, M520, M525

10 665 751 – Release 09/2007

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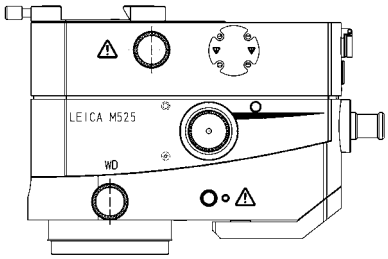

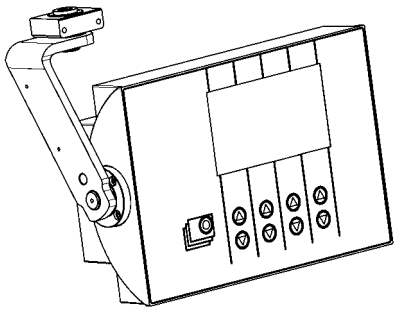

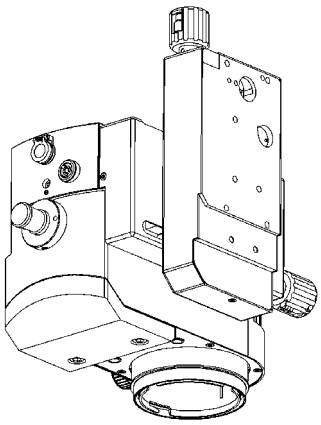

Release 09/2007

- First edition

1. Description - Leica M500 N, M520, M525

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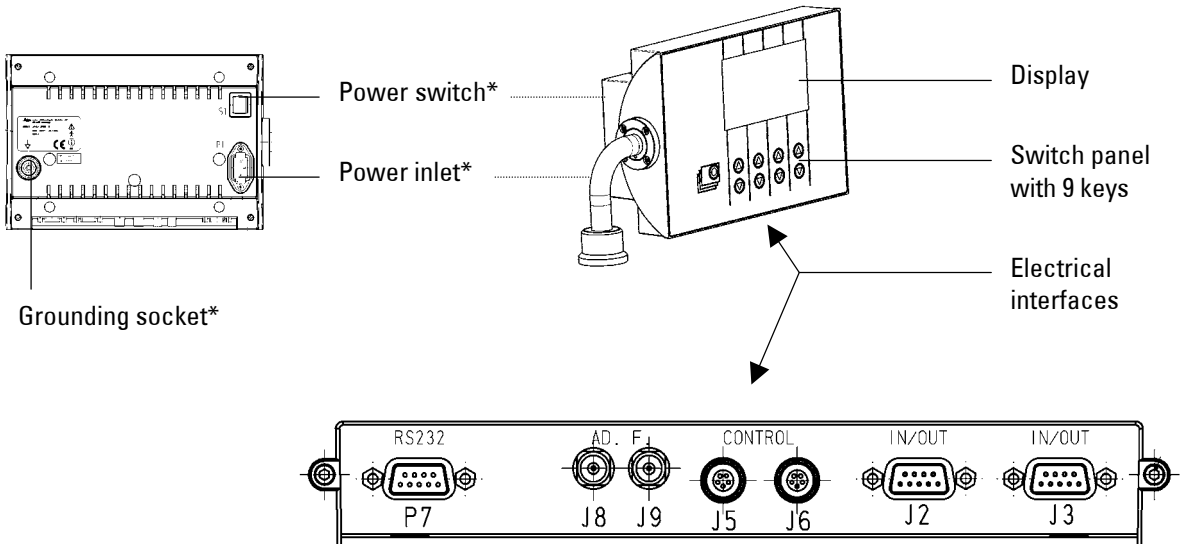
Description of the Leica M500 N, M520, M525

System description

General

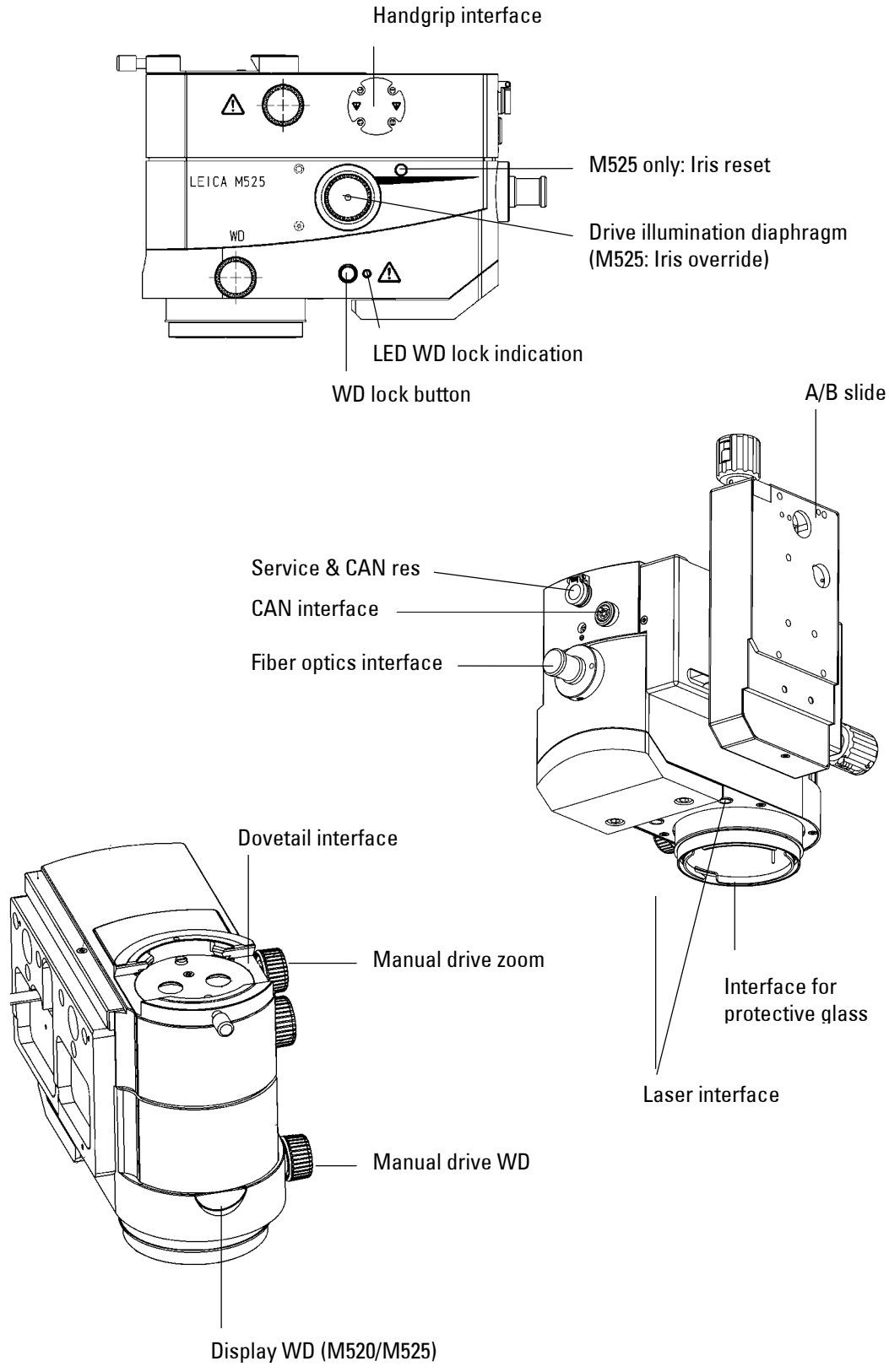
The Leica M500 N / M520 /M525 surgical microscope is an optical instrument which uses magnification and illumination to improve visibility. It is dedicated mainly for Neurosurgery discipline.
The microscope is always used together with a Leica stand system – refer to product history on page 1-5.
Electrically the optics carrier and the control unit are connected together to the stand system by the CAN bus.
Newer generations of stand systems (like OH4) have their own MDC (microscope device controller) and take over the task of the M500 N control unit.

Overview control unit M500 N / M520



* Only for control unit with internal power supply

Overview optics carrier M525



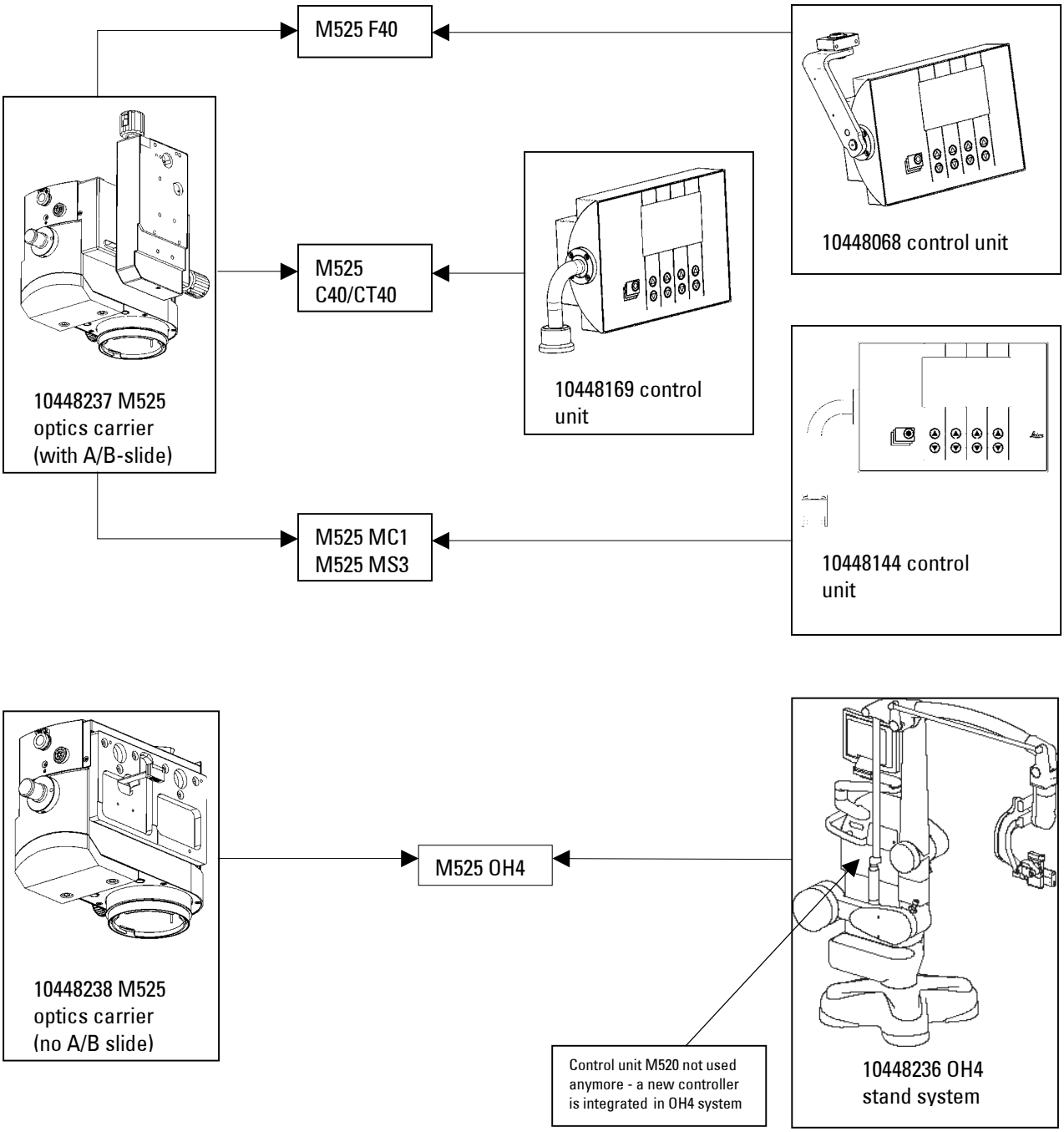
Electrical accessories

- All Leica hand- and footswitches fit to the control unit M500 N / M520 (restriction for 16 function switch – it is handled as a 12 function switch only)
- CAN handle
- DI C500
- Autofocus device
- Fluorescence devices (available for some stand systems only)

Optical/mechanical accessories

- All optical equipment with dovetail interface fit to the optics carrier. Refer to appropriate stand user manual for allowed loads and configurations
- Interface for protective glass 10 446 058
- Interface for universal Laser adapter 10 448 079 (M520 & M525)
- Interface for universal Laser adapter 10 446 615 (M500 N)
- Sterilisable knobs
- Interface for right handgrip
- Interface for fiber optic

Current configurations Leica M525 (state 08/2007)


M525 F40
10448068 control unit
10448237 M525 optics carrier (with A/B-slide)
M525 C40/CT40
10448169 control unit
M525 MC1
M525 MS3
10448144 control unit
10448238 M525 optics carrier (no A/B slide)
M525 OH4
Control unit M520 not used anymore - a new controller is integrated in OH4 system
10448236 OH4 stand system

Product history Leica M500N - M520 - M525

Date / event	Description:	Remark
1997 / Launch M500 N	10 446 481 M500 N optics carrier 10 446 489 control unit	For stand systems OHS1, MS1, MC1
02/2001 / product change in optics carrier	10 446 757 M500 N optics carrier replaces ~~10 446 481~~	New emergency drive for zoom
07/2001 / Launch with MS2	10 446 757 M500 N optics carrier 10 446 489 control unit	Additional for MS2 stand system
11/2002 / Launch with OH3	10 711851 control unit for OH3 10 448 019 M500 N optics carrier (without A/B slide)	Additional for OH3 stand system
04/2003 / Launch with MS3	10 446 757 M500 N optics carrier 10 446 489 control unit	Additional for MS3 stand system
10/2003 / Product change in optics carrier: New M520 optics carrier	10 448 029 M520 optics carrier replaces ~~10 446 757~~ for MS2, MS3, OHS1; 10 448 035 M520 optics carrier (without A/B slide) for OH3 replaces ~~10 448 019~~; Upgrade kit was available: 10 712 316, upgrade kit M500 N to M520 optics carrier; description 10 665 687; (~~10 446 757~~ to 10 448 070; ~~10 448 019~~ to 10448 071)	New illumination unit and new multifoc objective : More light 30%, increased working distance from 407 to 470mm, display for working distance, improved illumination optics – lead free glass. Zoom unit : new diaphragm (10 712 255) for better depth of field - reduced diameter to 12mm. New Lemo plug instead fixed CAN cable – external cable required. For stand systems OH3, OHS1, MS3, MS2, MS1, MC1
07/2004 / Launch M520 F40	10 448 029 M520 optics carrier for F40, 10 448 068 control unit for F40	Control unit without power supply and with new holder
03/2005 Product change of control unit: removed power supply	10 448 144 control unit replaces 10 446 489	All stand systems from 03/2005 on can provide 24V;
09/2005 Product launch M520 C40 and CT40	10 448 029 M520 optics carrier and new control unit 10 448 169 for C40 and CT40	Control unit compatible, but with new holder
07/2006 Product change in M520 optics carrier	10 448 029 M520 optics carrier and 10 448 035 M520 optics carrier with new zoom unit	Paint on zoom lenses as a diaphragm

09/2006 Product change to M525 optics carrier	10 448 237 M525 optics carrier replaces ~~10 448 029~~ for MC1, F40, MS3, C40, CT40 10 448 238 M525 optics carrier (without A/B slide) replaces ~~10448 035~~ for OH4 Upgrade kit available for limited time: 10 714 461 Upgrade kit M520 to M525; description 10 665 743 (~~10 448 029~~ to 10 448 246; ~~10 448 035~~ to 10 448 247)	New illumination unit, additional AutoIris function, new motor controller, removed illumination zoom. For stand systems OH4, MS3, MC1, F40, C40, CT40

Electrical description

General

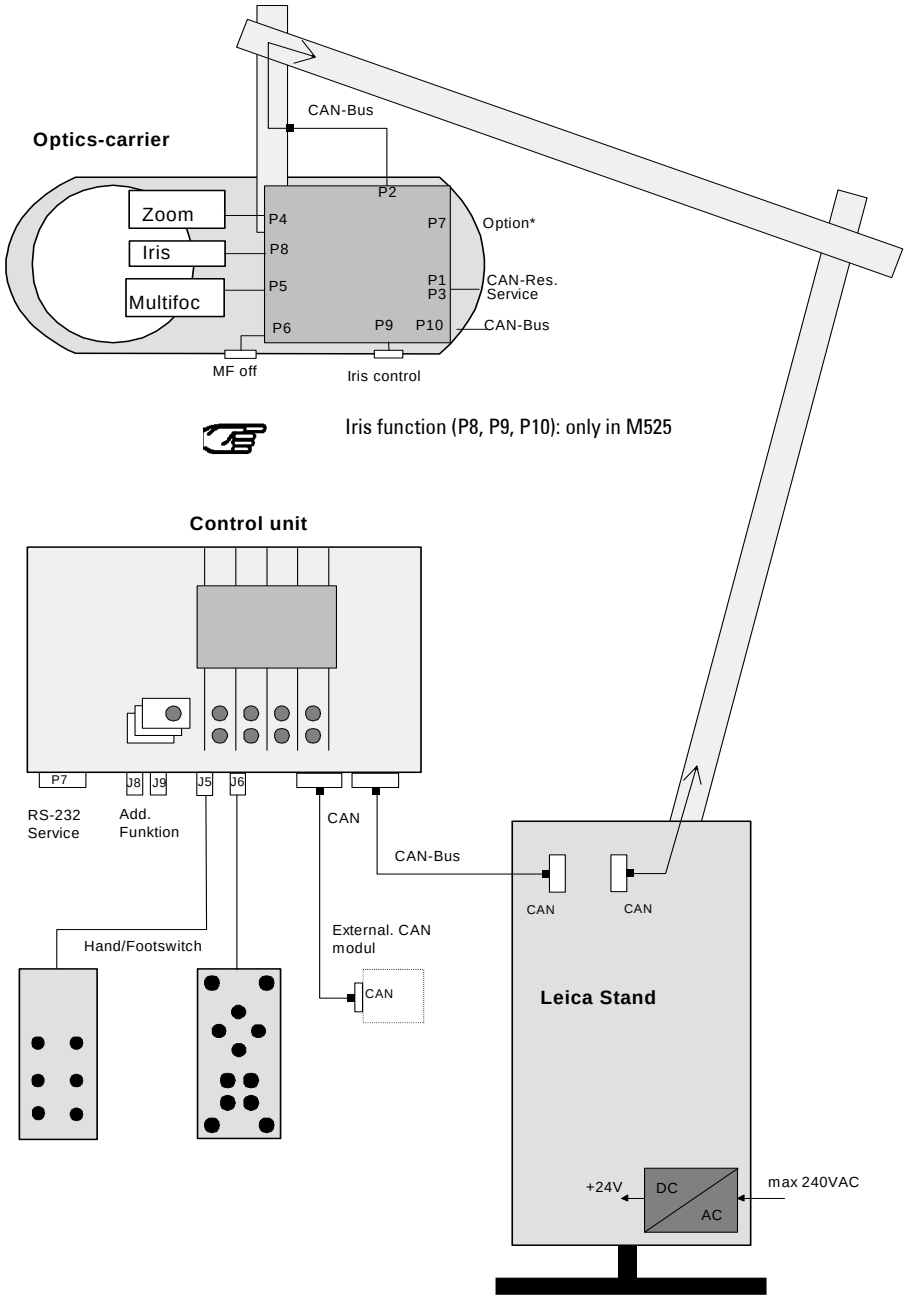
The optics carrier is a high performance operating microscope with adjustable working height and integrated zoom, with M525 also an integrated autoIris. The zoom- and the focus functions, for M525 also the Iris functions, are microprocessor controlled in order to give the user the maximum comfort. The electronics in the optics-carrier consists of only one board, with the microprocessor, memory, motorcontrollers and interfaces on it.

A control unit is needed to store the settings, to read hand/footswitches and to control the optics- carrier, manage CAN bus activities and to display the status/settings. It consists of one controller board, called control module, a LCD module and a switch panel. Former control units contain a power supply as well.

Overview of system:

*Possible options on CAN bus:

- CAN handle
- DI C500
- Autofocus
- Swing carrier
- Fluorescence



CAN bus

CAN-bus principle

The CAN-bus (Controller Area Network) is a bi-directional, two-wire bus. It is used to handle the communication between the control unit, the optics-carrier, the stand and other CAN devices. The CAN-bus uses a protocol which largely suppresses transmission errors.
The CAN bus in the M500 N/M520/M525 system is operated in the configuration "standard – CAN".

Data transfer

The bus is looped through each of the controllers. Data is transferred serially, bit by bit, with differential signals. The data transfer is rated at with 50kBit/s.
The data can be exchanged between each of the controllers. A data transfer consists of:

- Start bit,
- Identification, enabling the priority to be determined,
- The data itself, and
- CRC (Cyclic Redundancy Check).

Each controller recognizes the data related to its task. If a controller wants to send data, it has to wait until the bus is free. The feature of setting the priority of commands is not applied in the M500 N/M520/M525 system; all commands have the same priority.

Command interpretation by control unit

The control unit reads CAN commands from CAN handles and from other CAN members. It interprets the received commands and releases appropriate commands to the CAN bus. The concerning CAN device will then release a required action.

Safety concept - brake watch dog

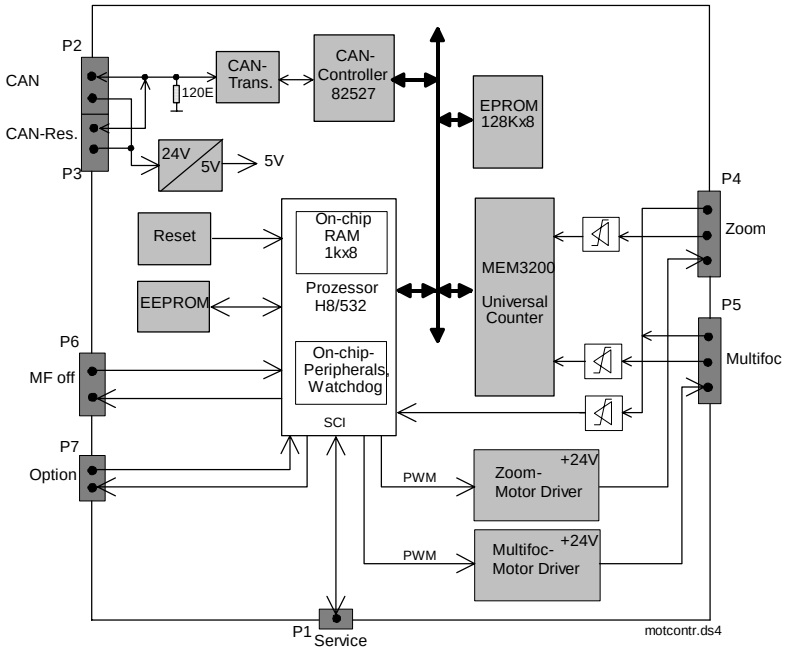
The control unit must periodically (100ms) send a brake state message. If no periodic brake state message is received by the connected stand/brake controller, all brakes will lock.

Terminating impedance

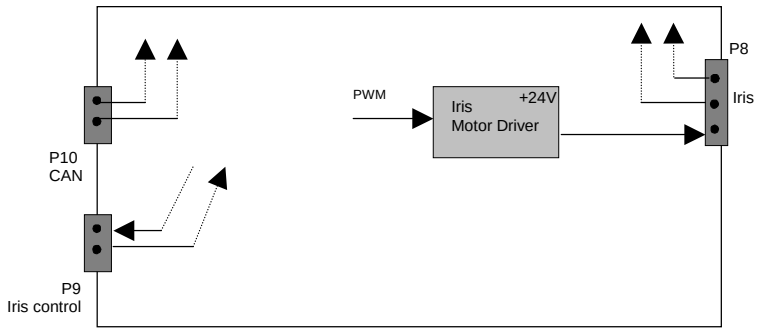
In control unit: the end of the CAN-bus is terminated with an impedance of 120Ω. The controller detects if it is at the end of the bus or if another device is connected (CAN cable is coded: Pin 4 is bridged to pin 8 in the connector housing).
In optics carrier: the controller of the optics carrier is always terminated by 120Ω; other devices, connected to the bus at the optics carrier are not terminated.

Optics carrier

Blockdiagram motorcontroller M500 N, M520



Addition for motorcontroller M525:



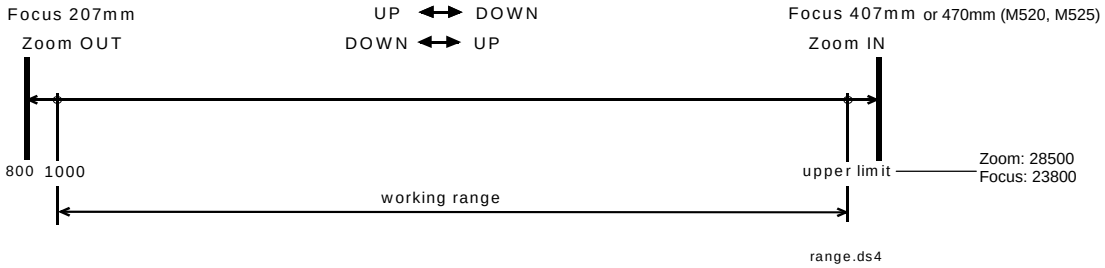
Powering

The optics-carrier is powered via the CAN-bus cable with +24VDC.
Power consumption is appr.
50mA in wait state,
150mA when one motor is running;
500mA when both motors, focus and zoom are blocked.
A DC/DC converter on the motorcontroller delivers +5V for logic supply. The +24VDC is measured on the controller board with the microprocessor analog input. It can be asked in the diagnostic menu of the control unit.

Processor
A watch-dog is integrated in the H8-processor. It observes the running of the main program. Diagnosis LED's might help with trouble shooting, refer to chapter 4 – fault finding / diagnosis LED's.
The PWM outputs are driven with the optimum frequency of 20kHz (above the noise-limit, below magnetization problems).

Motor driver
The zoom- , focus and Iris motors are powered with a +24V PWM-signal. A one-chip controller receives enable-, direction- and the puls-rate-information from the processor and drives the motors accordingly. All motors have an encoder mounted directly on the motor axis. The encoder pulses are received by a counter, where the A/B-signals (direction) are decoded and the actual position transferred further to the processor. A current limitation for the motors becomes active for current > 0,3A.

Range
The initializing of the microscope sets the lower limit to 1000 encoder-pulses. The actual upper limit is determine with counting the encoder-pulses (constants are stored for these values; deviations of the displayed values are possible due to mechanical tolerances).



RS232
A serial interface for service purposes is available. It is directly wired to the Optics-carrier processor - and has therefore other signal level for TxD than RS232 standard.

Recognition of optics carrier type
Since the increase of the working distance from 407 to 470mm (M500 N to M520) a recognition of the optics carrier type is required. A bridge on P6 (pin1-pin4) is installed in optics carrier M520 and M525. A status command, requested from control unit at system start , delivers the information if the bridge is installed or not.

Additional functionality on motorcontroller for M525
The AutoIrsis function in the M525 required an additional motor and a redesign of the motorcontroller. All existing functions were taken over (backwards compatible) and additional circuits for Iris motor drive and Iris control were integrated. The movement of the Iris motor is completely handled by the motorcontroller, no direct access via the CAN bus is possible.

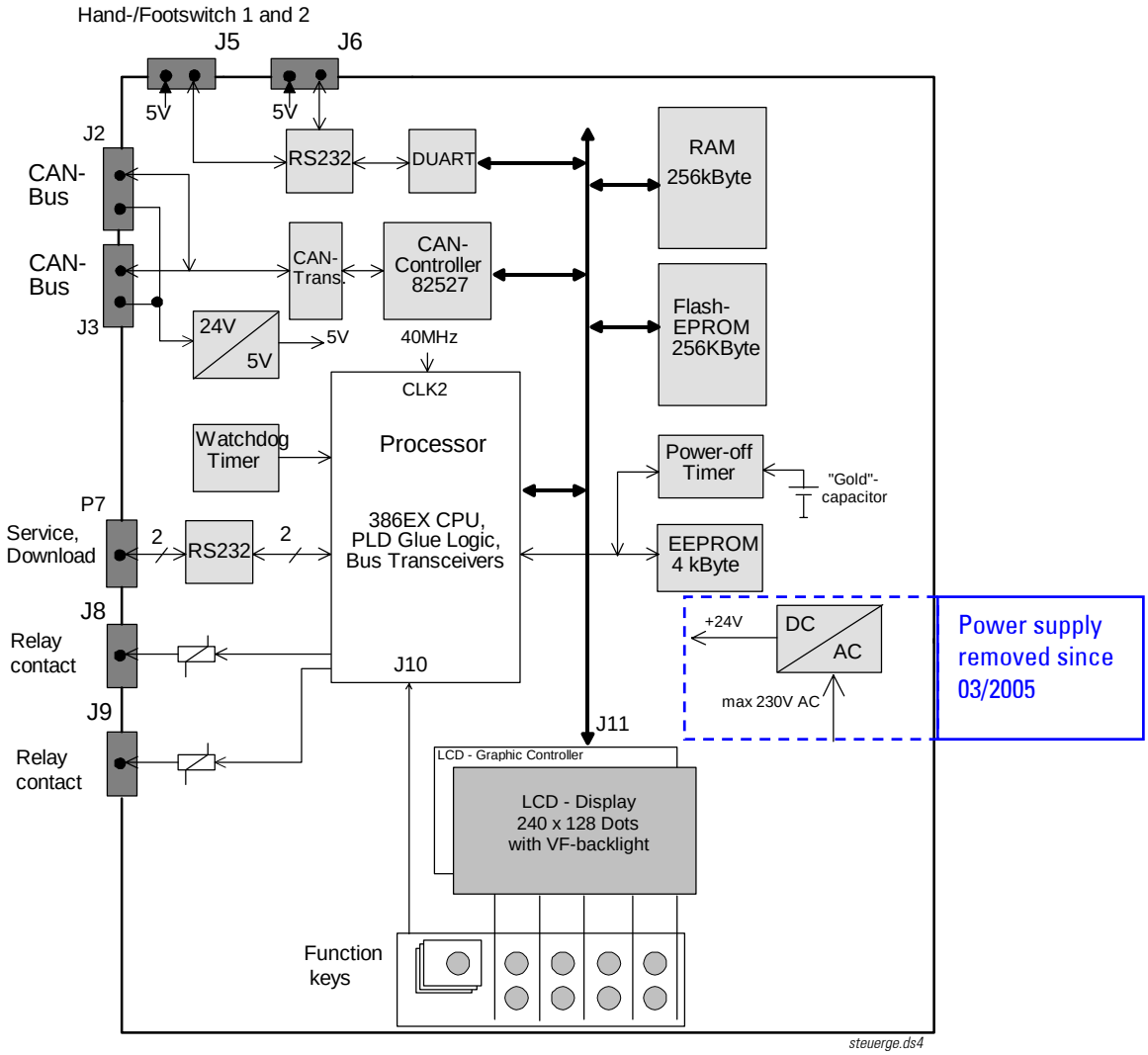
Software history

Software version	Release date	HW motorcontroller	Compatibility	Remark
1.4	02/98	10 661 250	M500 N	
2.3	04/99	-"-	M500 N	
2.4	05/01	-"-	M500 N, M520	
4.4	xx/06	10 714 356	M500 N, M520, M525	

Software compatibility in respect of control unit see chapter inspection / step 2.13.

Control unit

Blockdiagram



Powering

Control units before 03/2005 had a power inlet for 230VAC ad the built-in power supply could feed the system with +24VDC. This was required in stand systems having no own power supply like the MC1.
Since 03/2005 all stand systems have their own power supply. So the power supply was removed from control unit, now it is supplied via the CAN bus cable with 24VDC.

Processor

An Intel 386EX Processor is used. It is clocked with 20MHz. The memory consists of 256kByte RAM, 256kByte Flash-EPROM and 4kByte EEPROM. The software can be updated/downloaded through the RS232 service-interface.
A watch-dog is integrated, it observes the running of the main program. Diagnosis LED's might help with trouble shooting, refer to chapter 4 – fault finding / diagnosis LED's.

Display / Keyboard
The communication with the user is done with help of an high-contrast display and a keyboard with nine keys. The display is a LCD Matrix (240x128 dots) with integrated Graphic controller and backlight.

Can-bus
The CAN-bus has two go-through-input/outputs with two identical parallel connectors.

Hand/Footswitch
There are two RS232 interface-connectors available for all available hand / footswitches. They are wired to the DUART-interface and are clocked with 4800 Baud. The control unit periodically (60ms) sends a request to the connected footswitch. It sends back a status code (2 Byte), indicating which key is pressed/not pressed.

Service interface
A double RS232 interface is provided for service purposes. They are both wired directly to the Processor (RXD0/TXD0, RXD1/TXD1) The connector P7 is used for both of them. COM1 (RXD0/TXD0) is programmed for a service-terminal, for example for downloading new software version into the Flash-EPROM.

Additional function
There are two relay-contacts on the control unit connector panel for additional functions. The maximum permissible loading for one contact is 1 A/24 V DC. The relay-contacts can be programmed to switch- or toggle mode.

Software history

Software version	Release date	HW control module	Compatibility	Remark
1.4	02/98	10 661 330	M500 N	
1.54	01/00	-"-	M500 N	
1.76	04/02	-"-	M500 N	Supports Can handles, DI C500
1.81		-"-	M500 N	Supports OH3
1.84		-"-	M500 N	Supports MS3, CAN handle can be configured separate
1.87		-"-	M500 N, M520, M525	Supports M520, M525

Software compatibility in respect of optics carrier see chapter inspection / step 2.13.

Technical data

Optics carrier M525

Stock n°	10448237 M525 optics carrier 10448238 M525 optics carrier OH4
Zoom	6:1 zoom, motorized
Magnification	Total magnification with 10x eyepiece 1,2 x to 12,8
Working distance	207-470 mm, variable through motorized multi-focal lens, continuously adjustable; manually adjustable by emergency knob
Display	Analog display of working distance
Field of view (diameter)	16,5mm to 180 mm with 10x eyepiece
Objective	Multi-focal lens 207-470 mm variable working distance
Illumination	Continually adjustable illumination field diameter with gauss-shaped light distribution
AutoIrisTM	Built-in automatic zoom-synchronized illumination filed diameter with manual override and reset feature
Outlet interface	Dovetail ring

Control unit M500 N/M520

Stock n°	10448169 (M525 C40/CT40) 10448068 (M525 F40) 10448144 (MC1, MS3)
Display	LCD display
Adjustment of	Speed for zoom and focus, brightness and backlight intensity of display, WD and zoom
Interfaces	RS232 for service 2x RS232 for foot/handswitch 2x additional function (programmable relay contact)
CAN port	Two CAN-ports, 24V max 50W

2. Wiring and locations Leica M500 N, M520, M525

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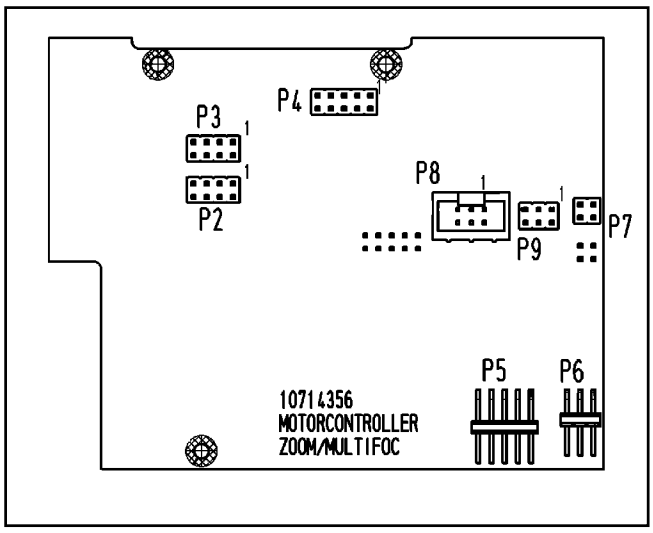
Wiring diagram M525 719072	2-9
Wiring diagram M500 N / M520 707276	2-11

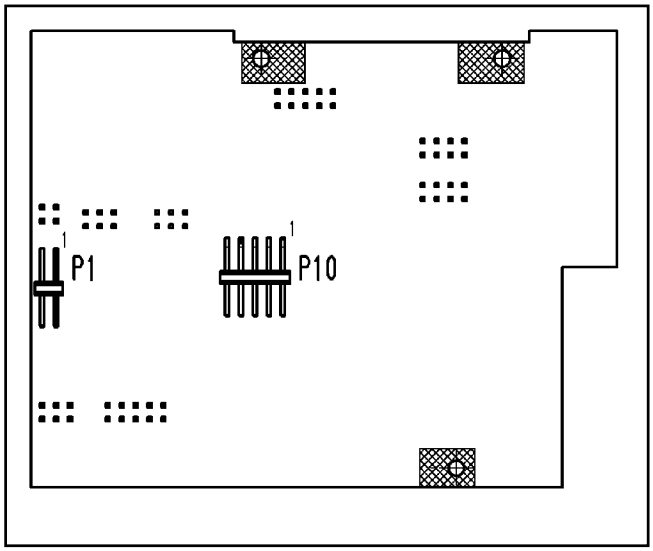
Wiring and locations Leica M500 N, M520, M525

Optics carrier

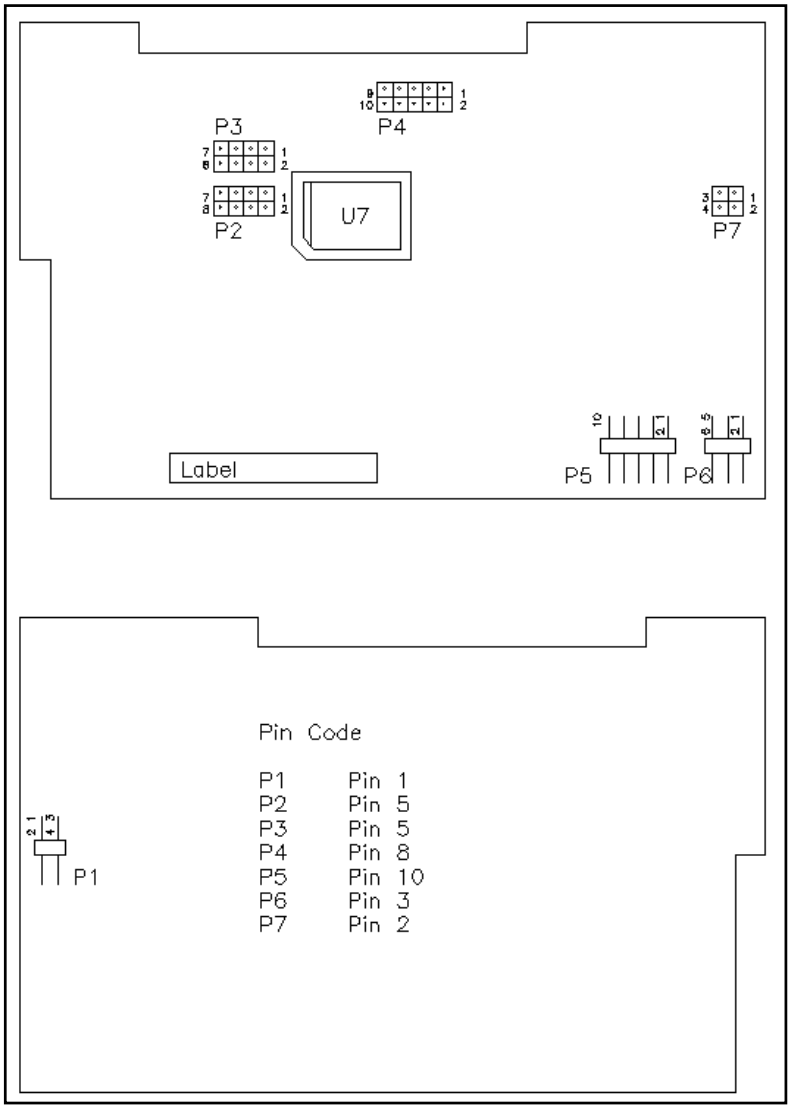
Zoom/multifoc motor controller 10714356



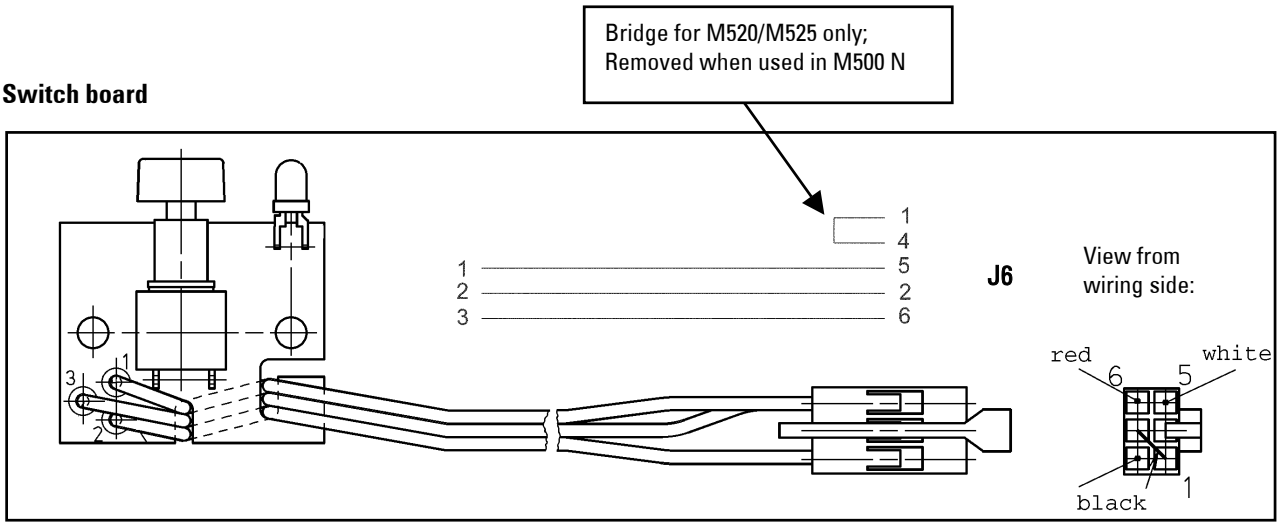
Connector coding:
P1 = Pin1 (to cut off)
P2 = Pin5 (to cut off)
P3 = Pin5 (to cut off)
P4 = Pin8 (to cut off)
P5 = Pin10 (to cut off)
P6 = Pin3 (to cut off)
P7 = Pin2 (to cut off)
P9 = Pin6 (to cut off)
P10 = Pin5 (to cut off)



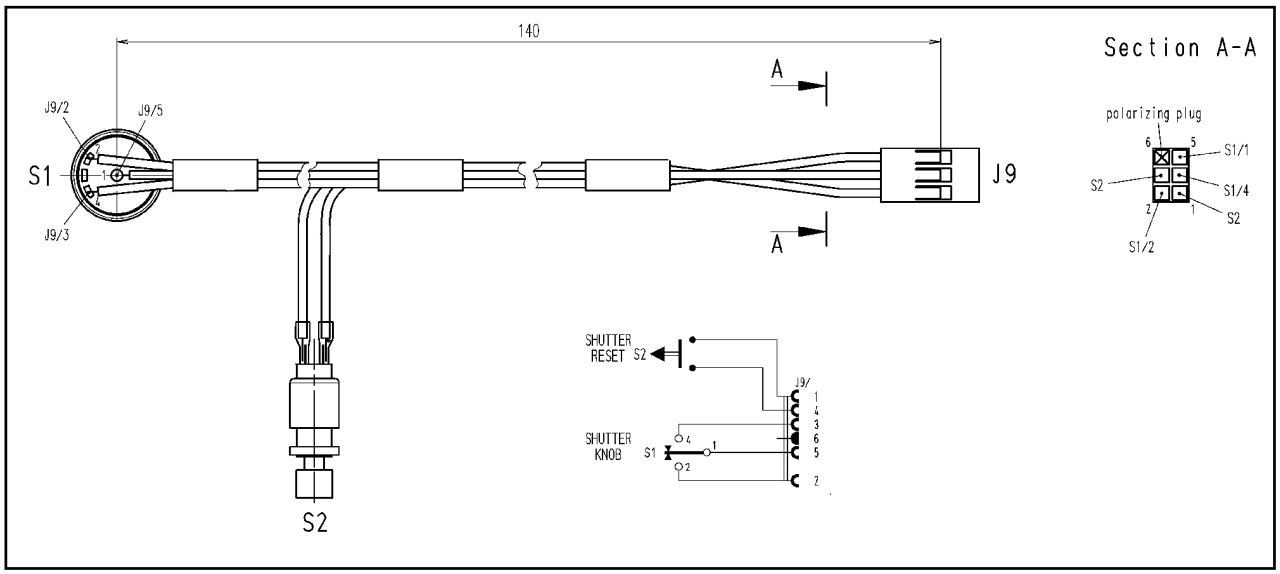
Zoom/multifoc motor controller 10661250 (M500 N/M520 only)



Switch board

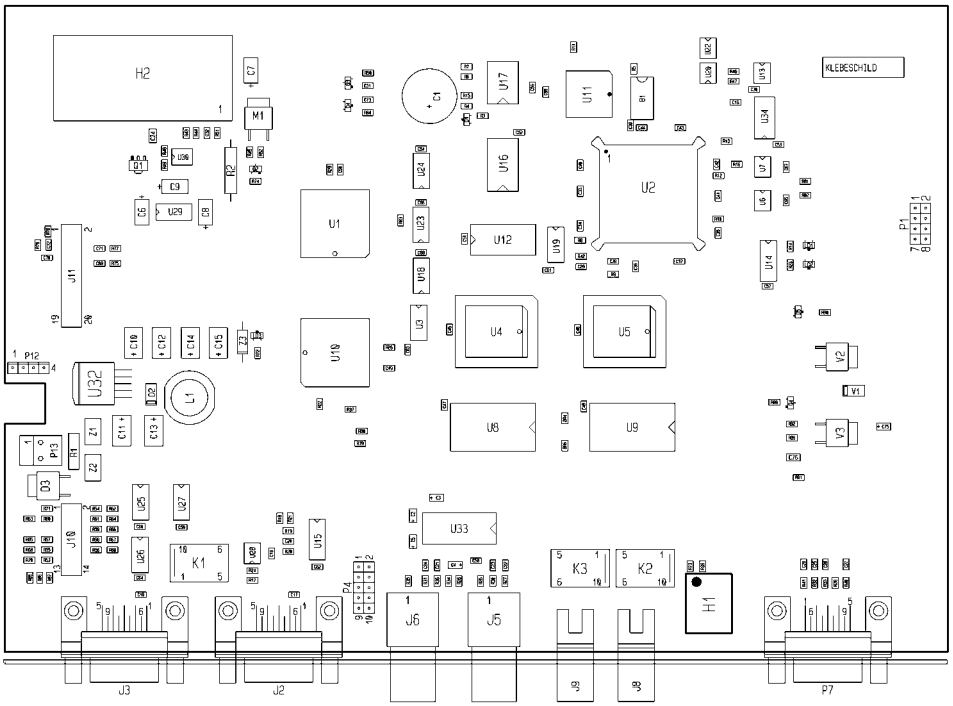


Iris switch assembly

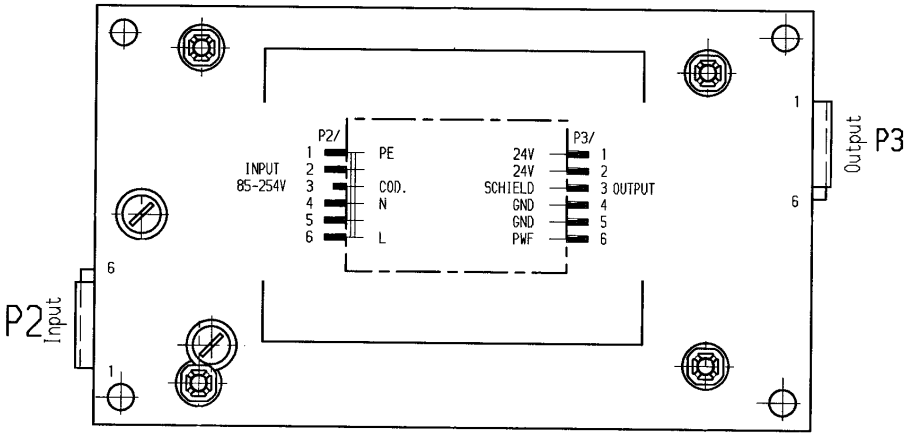


Control unit

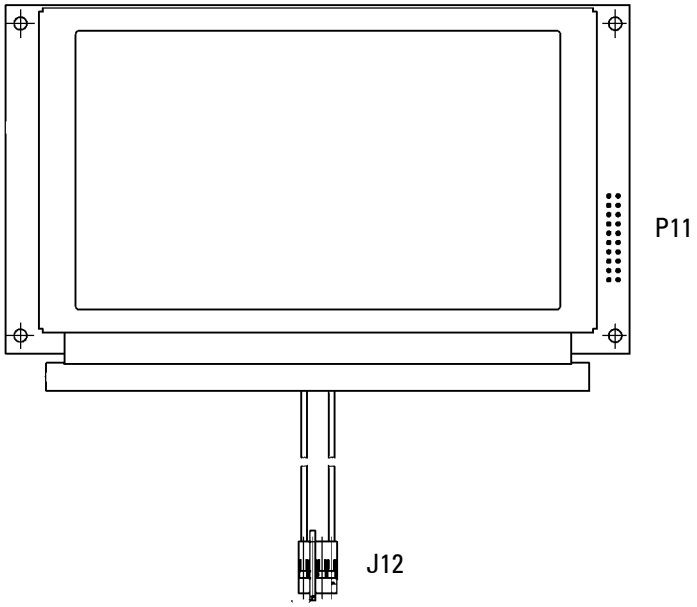
Control module



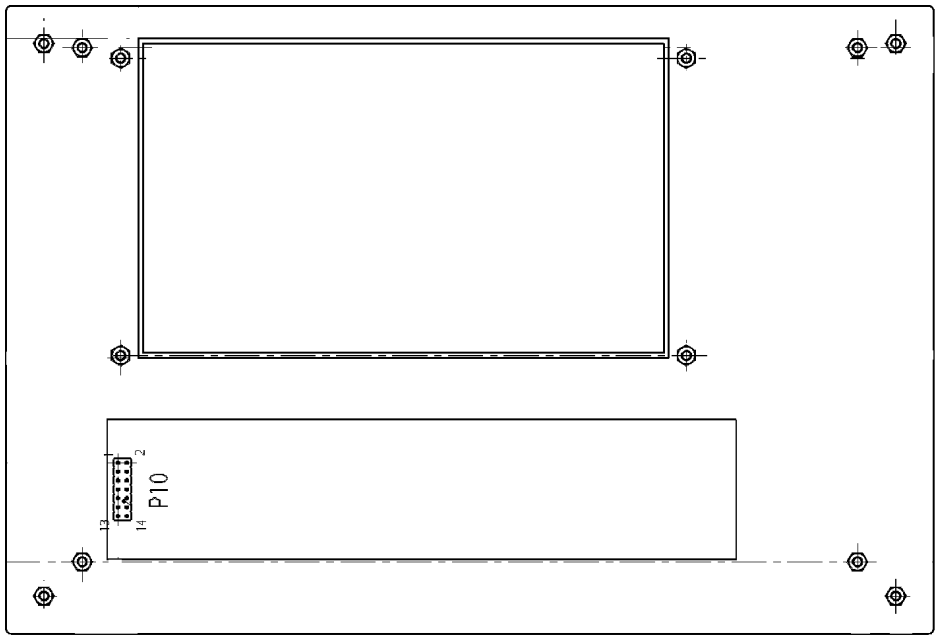
Power supply (only in control units till March 2005)



LCD module



Switch panel



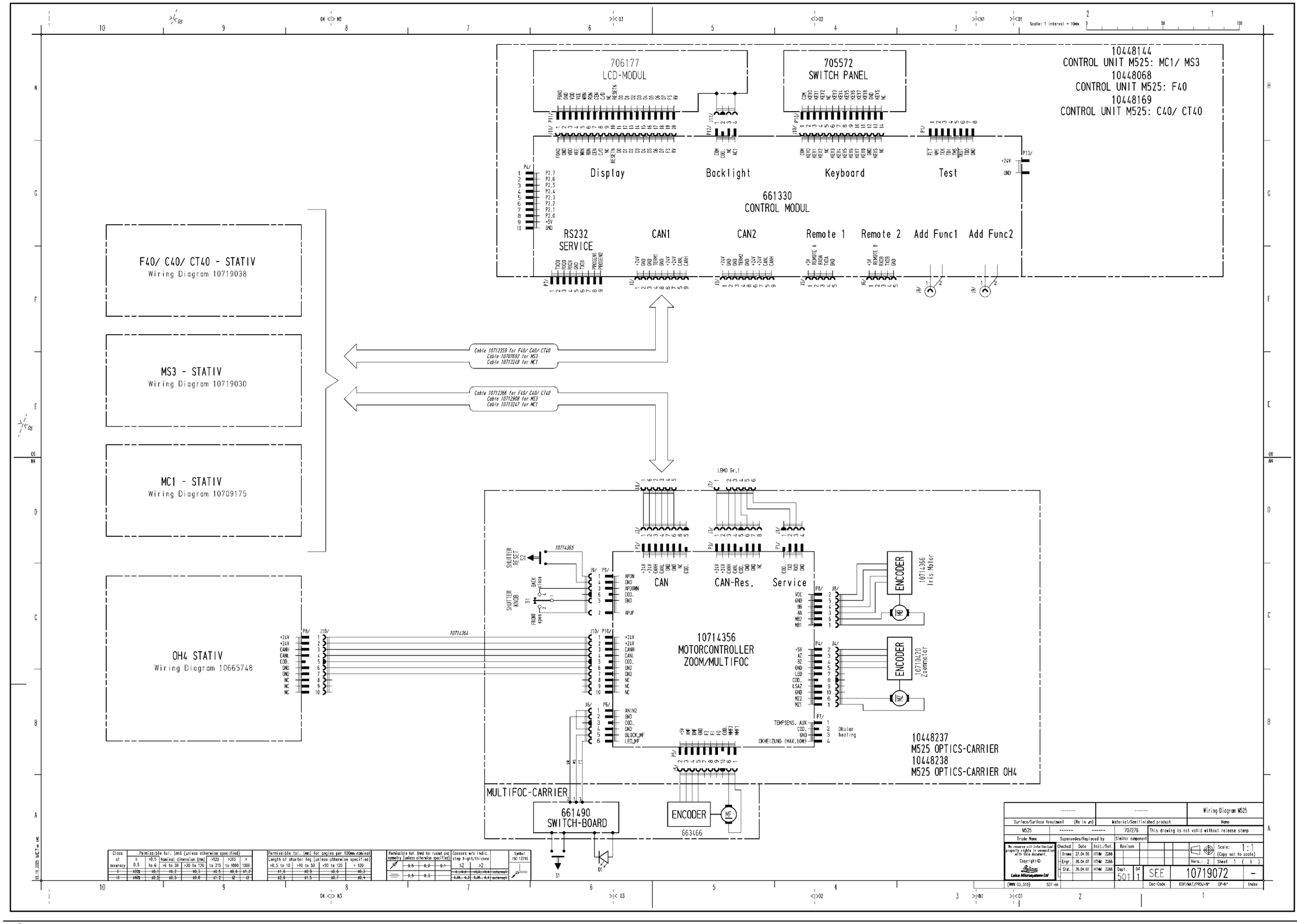
Overview of connectors

Connector	Page	Module / connecting to
Optics Carrier		
P1	2-1, 2-2	Motor controller / service port
P2	2-1, 2-2	Motor controller / CAN
P3	2-1, 2-2	Motor controller / CAN res.
P4	2-1, 2-2	Motor controller / zoom motor
P5	2-1, 2-2	Motor controller / focus motor
P6	2-1, 2-2	Motor controller / switch board
J6	2-2	Switch board
P7	2-1, 2-2	Motor controller / Res.
J7	-	Optics carrier / Service/CAN res. (Lemo with cap)
P8	2-1	Motor controller / Iris motor
P9	2-1	Motor controller / Iris switch assembly
J9	2-3	Iris switch assembly
P10	2-1	Motor controller / CAN (to stand system)
Control unit		
P1	2-4	Control module / test port (not used)
P2	2-4	Power supply / input power
J2	2-4	Control module / CAN1
P3	2-4	Power supply / output power
J3	2-4	Control module / CAN2
P4	2-4	Control module / not used
J5	2-4	Control module / remote 1
J6	2-4	Control module / remote 2
P7	2-4	Control module / service RS232
J8	2-4	Control module / add. function 1
J9	2-4	Control module / add. function 2
J10	2-4	Control module / switch panel
P10	2-5	Switch panel / control module
P11	2-5	LCD module / control module
J11	2-4	Control module / LCD module

P12	2-4	Control module / LCD module backlight
J12	2-5	LCD module /control module
P13	2-4	Control module / input from power module

Wiring diagrams in A3 format

Wiring diagram M525 10719072 on page 2-9
Wiring diagram M500 N/M520: 707276 A on page 2-11


706177
LCD-MODUL
705572
SWITCH PANEL
10448144
CONTROL UNIT M525: MC1/ MS3
10448068
CONTROL UNIT M525: F40
10448169
CONTROL UNIT M525: C40/ CT40
Display
Backlight
Keyboard
Test
661330
CONTROL MODUL
RS232
SERVICE
CAN1
CAN2
Remote 1
Remote 2
Add Func1
Add Func2
F40/ C40/ CT40 - STATIV
Wiring Diagram 10719038
MS3 - STATIV
Wiring Diagram 10719030
MC1 - STATIV
Wiring Diagram 10709175
OH4 STATIV
Wiring Diagram 10665748
Cable 10712359 for F40/ C40/ CT40
Cable 10707592 for MS3
Cable 10713248 for MC1
Cable 10712366 for F40/ C40/ CT40
Cable 10712908 for MS3
Cable 10713247 for MC1
LEMO Gr.1
10714365
SHUTTER RESET S2
SHUTTER KNOB S1
BACK
FRONT
CAN
CAN-Res.
Service
10714364
10714356
MOTORCONTROLLER
ZOOM/MULTIFOC
ENCODER
10714366
Iris Motor
10711ANZ0
Zoommotor
Okular heating
10448237
M525 OPTICS-CARRIER
10448238
M525 OPTICS-CARRIER OH4
MULTIFOC-CARRIER
661490
SWITCH-BOARD
663466
D1
S1
Wiring Diagram M525
707276
This drawing is not valid without release stamp
SEE
10719072

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Änderung

ZONE	Index	Beschreibung	Datum	Name
E4	A	Kabel steckbar J8/P8	31.10.03	HTHM

CONTROL UNIT M500-N

706177
LCD-MODUL

705572
SWITCH PANEL

Display

Backlight

Keyboard

Test

661330
CONTROL MODUL

RS232
SERVICE

CAN1

CAN2

Remote 1

Remote 2

Add Func1

Add Func2

POWER SUPPLY

INPUT
85V bis 254VAC
50/60Hz

Power supply removed since 03/2005

BASISMODUL

SWING-CARRIER

OVERHEAD-STAND OHS (WIRING DIAGRAM 707277)

M500-N SYSTEM

CAN

CAN-Res.

Service

ENCODER

661250
MOTORCONTROLLER
ZOOM/MULTIFOC

OPTICS-CARRIER

MULTIFOC-CARRIER

661490
SWITCH-BOARD

ENCODER
663466

② Für Betrieb mit Stativ

① Für Betrieb ohne Stativ

Genauigkeitsgrad	Zulässige Abweichung fuer antolerierte Laengenmasse: bis	>0,5 bis 6	>6 bis 30	>30 bis 120	>120 bis 315	>315 bis 1000	ueber 1000
		Nennmassbereich					
f	±20%	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2
m	±40%	±0,2	±0,5	±0,8	±1,2	±2	±3

Zul. Abweichung f. antol. Winkelmasse pro 100 mm: Nennmassbereich des kuerzeren Schenkels	>0,5 bis 10	>10 bis 50	>50 bis 120	ueber 120
	±1,5	±0,9	±0,6	±0,3
	±2,5	±1,5	±0,7	±0,4

Zulaessige Abweichung fuer antol. Form-Rundheit u./od. Symmetrie	0,5	0,2	0,1
	0,5	0,3	

Konten o. Angaben Abnahmekante/Ecke	≤2	>2
	0...0,2	+0,1...0,4 fasen
	0,08...0,2	0,08...0,41 ausser

Symbol ISO 13715

6,3	-----	-----	Wiring Diagr. M500-N				
Oberflaeche/Oberflaechenbehandlung (Ra in µm)		Werkstoff/Halbzeug	Benennung				
M500-N	----- -----	-----	CAD	FK: 330			
Handelsbez.	Ers. fuer/durch	oehnl. Teil	Bemerkung				
Fuer dieses Dokument behalten wir uns alle Rechte vor (DIN16161)	Geprueft	Datum	Vis/Tel	Aenderung		Massstab: 1 : 1 (auf Kopien unverb.)	
	Gez	2.7.1997	HTHM 2466	A	31.10.03		
	Freig	3.9.1997	HTHM 2466			Vers.: 2 Blatt 1 (1)	
Leica Leica Microsystems AG	Norm	3.9.1997	HTHM 2466	Bereich 501	04 1	FKZ 707276	A
Bezug 3344 Nr.1.E 471400	SPF-de Nr.2.E 471401			J.E	DOK-CODE	EDV/MAT/PROJ-NR	AVO-NR INDEX

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3. Service programs - Leica M500 N, M520, M525

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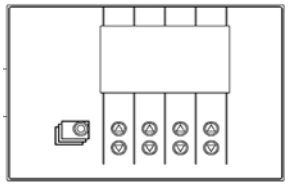
Service programs control unit	3-1
Software upgrade program for control unit and optics carrier	3-3

Stock n°	Description / Specification	Remark	Drawing

Service programs – Leica M500N, M520, M525

Service programs in control unit



How to enter the service functions:

- Enter the service menu of the M500 N/M520 control unit in menue II
- Enter security code: 6642
- Select the service functions

Validity

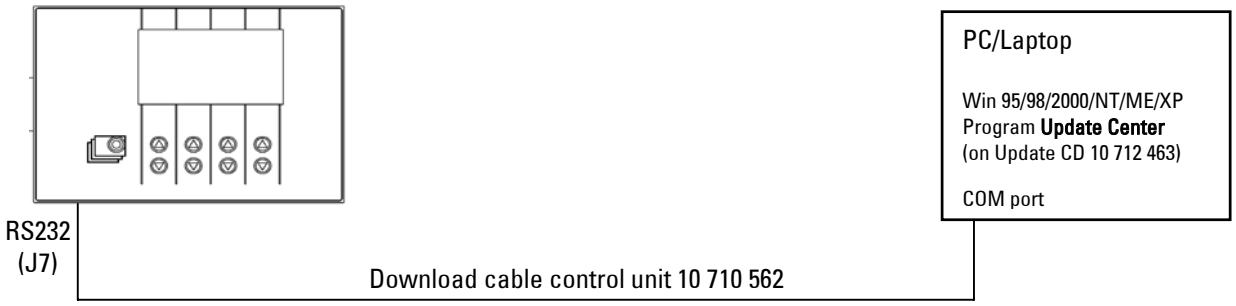
Below description refers to SW 1.87 in the control unit and 2.4 or 4.4 in optics carrier.

Service function	Description	Remark
Standard and user configuration	Settings of user- **and standard configuration** can be changed and stored.	Refer to stand user manual.
Ad. Function 1 output configuration	The output of additional function 1 can be set and stored either to toggle or to switch mode.	Switch mode: relais contact closes as long as the release button is pressed. Toggle mode: relais contact opens/closes with each activation of the release button.
Ad. Function 2 output configuration	The output of additional function 2 can be set and stored either to toggle or to switch mode.	-"-
Screen saver setting	Screen saver for control unit display: after the selected time the brightness will be reduced.	Adjustable between 0..60 minutes. Default = 5 minutes. 0 minutes will disable screen saver.
User parameter save time setting	When user settings are saved, the display shows "User setting saved at…" for a certain time; this time can be altered.	Adjustable between 2..6 seconds. Default = 4 seconds.
Power off timer setting	A power off / power on within the selected time will effect: The last selected user (before switching off) is automatically taken as the actual user.	Adjustable between 0..60 minutes. Default = 5 minutes.

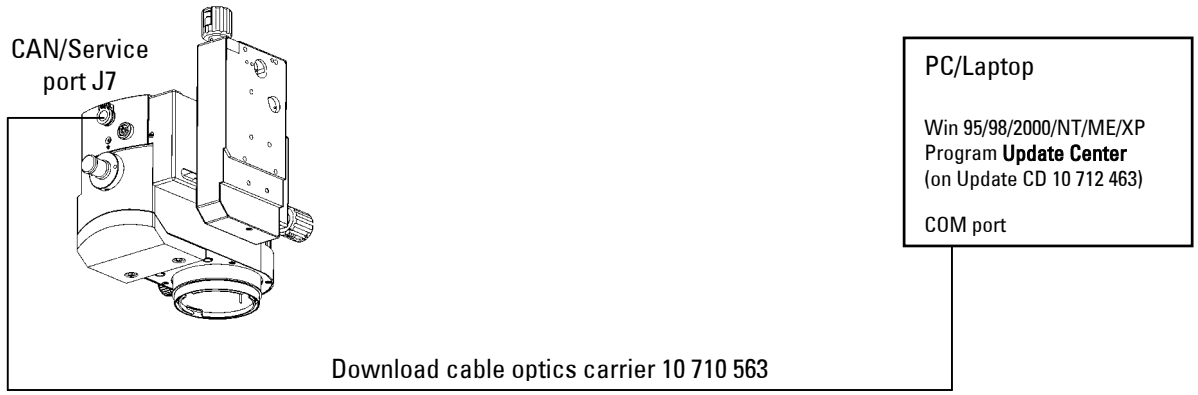
Service function	**Description**	**Remark**
User selection timer setting	During the power up routine the control unit allows to select a user; if no user is selected within a certain time it will take the standard settings.	Adjustable between 2..20 seconds. Default = 11 seconds.
Tube focal length setting	The setting influences the displayed magnification value in the main menu.	Adjustable between 100..200. Set to focal length of main tube. Default = 170.
Exception reboot timer setting	If an error causes an exception reboot of the control unit, the error can be displayed for a certain time before the reboot starts.	Adjustable between 0..20 seconds. Default = 10 seconds.
Set device list	Connected CAN devices have to be set to “present”. Not connected CAN devices have to be set to “Not present”.	 If the device list is not set correctly, it may result in malfunction and/or error messages. Available CAN devices: Stand (M500-N) Microscope (M500-N) Microscope (M500-O) X/Y-Unit (M500-O) Autofocus (M500-N) Handle R (M500-N) Handle L (M500-N) DI control (M500-N) Swing carrier (MS3)
Restore factory defaults	All standard and user settings will be reset to the factory default values.	 All user settings will be lost.
Autofocus setup	Autofocus video parameters and autofocus range parameters are set in this menu.	Details in service manual BIV/Autofocus 10 665 645.
Stand setup	Opens a monitor for entering setup / service program of the connected stand system.	Details in the appropriate stand service manual.
DI Default Settings	Shutter functions and shutter mode are set in this menu.	Details in service manual Neuro modules 10665683.
DI Color LCD Module Settings	Video parameter for the LCD display of the DI-module are set in this menu.	Details in service manual Neuro modules 10665683.

Software upgrade program

Software update for control unit
The M500 N/M520 control unit allows a SW update by Laptop/PC. The control unit can be set into a service mode. In this mode the control unit accepts data via the RS232 service interface (P7). An update program, running on a PC/laptop sends the SW via serial port (RS232).
Technical details:
RS232-parameter 19200/8/1/no; transmit and receive signals RS232 compatible;



Software update for optics carrier
The M500 N/M520/M525 optics carrier allows a SW update by Laptop/PC. The motorcontroller accepts data via the RS232 service interface (either at the capped Lemo plug J7 or the internal plug J1). An update program, running on a PC/laptop sends the SW via serial port (RS232).
Technical details:
RS232-parameter 19200/8/1/no; receive signal RS232 compatible; transmit signal 0...5V (HCMOS)



Software update procedure
Refer to update description (doc code10 665 668).
The content of the Update CD is available on the intranet as well.

Stock n°	Description / Specification	Remark	Drawing

4. Fault finding - Leica M500 N, M520, M525

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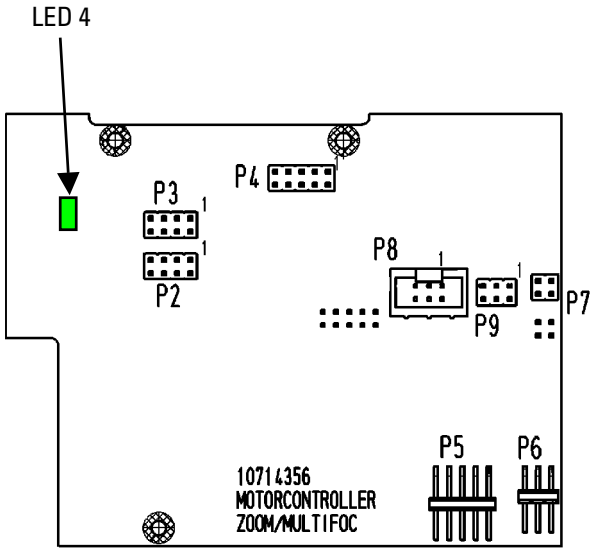
Start-up sequence	4-6
Error messages	4-7
Diagnostic functions in control unit	4-12

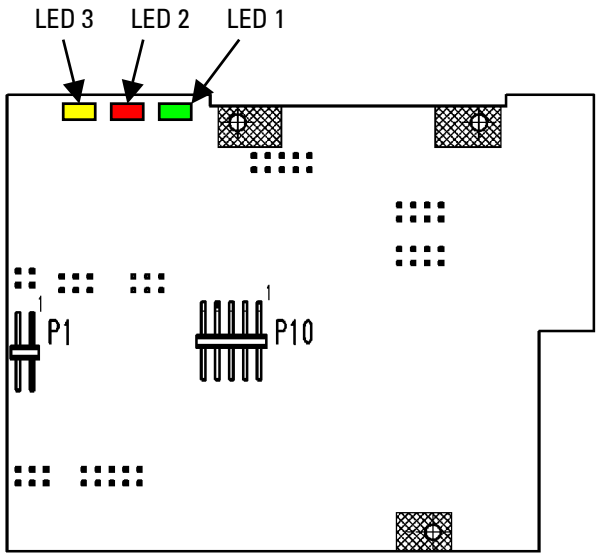
Fault finding - M500 N, M520, M525

Diagnosis LED's

Zoom/multifoc motor controller 10714356

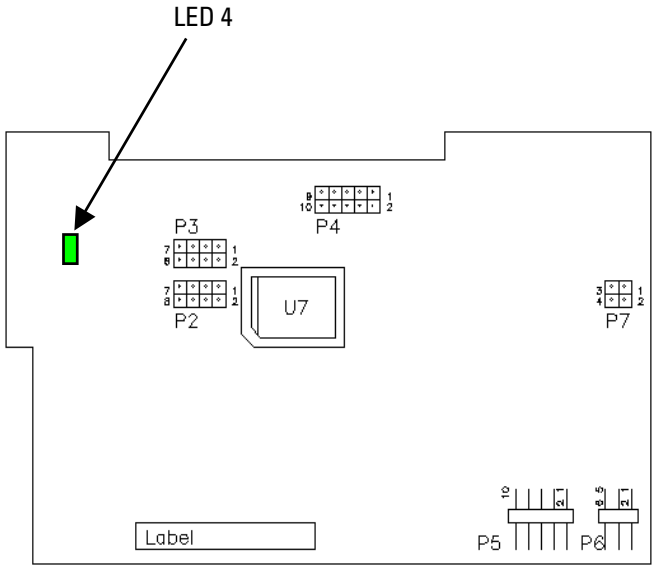
LED 1	green	Watchdog - blinking with 2Hz, indicates that the main program is running.
LED 2	red	Enable zoom - "On" when the zoom motor is driven or short-circuited (damaged). "Off" when the motor is set free.
LED 3	yellow	Enable multifoc - "On" when the multifoc motor is driven or short-circuited (damaged). "Off" when the motor is set free.
LED 4	green	+5V-Powering - "On" when the switching regulator is working.

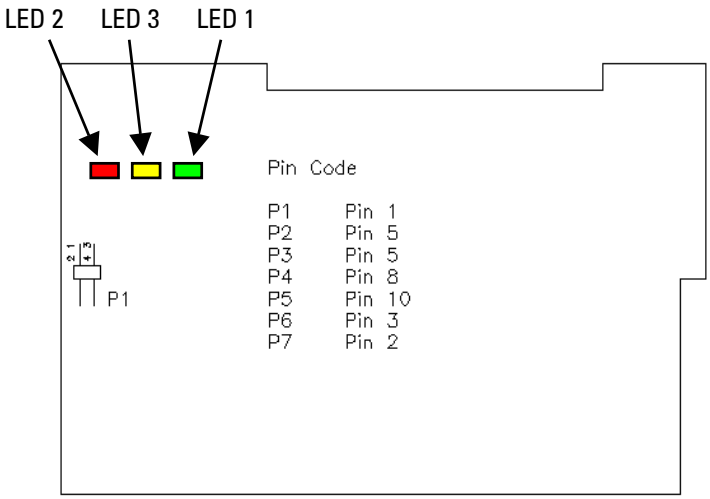




Zoom/multifoc motor controller 10661250 (M500 N/M520 only)

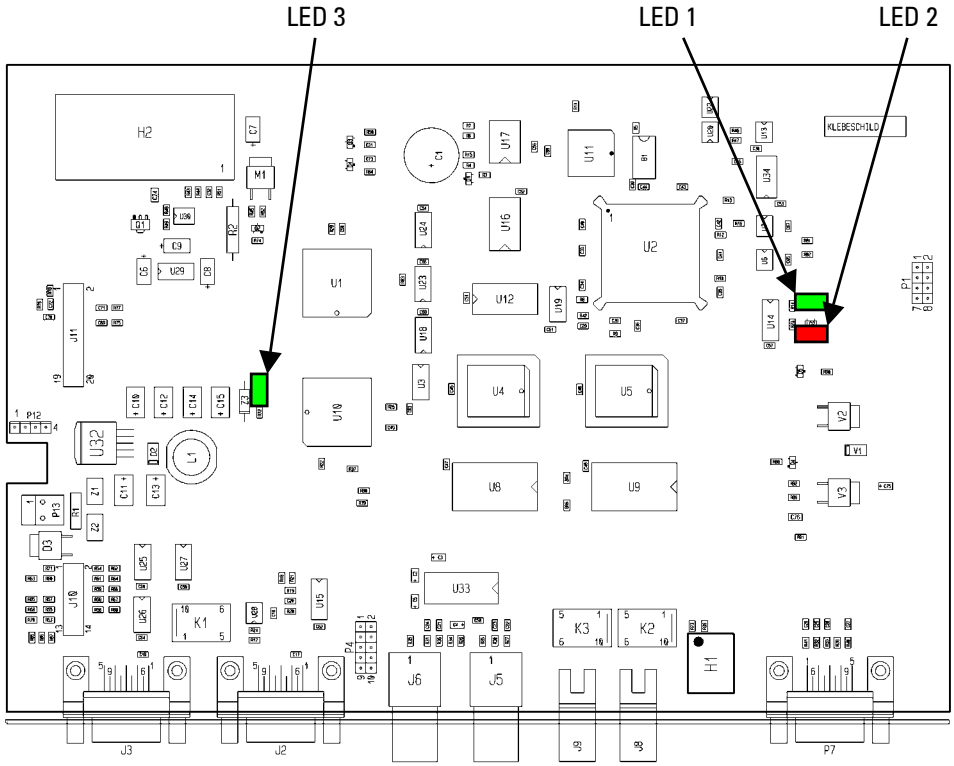
LED 1	green	Watchdog - blinking with 2Hz, indicates that the main program is running.
LED 2	red	Enable zoom - “On” when the zoom motor is driven or short-circuited (damaged). “Off” when the motor is set free.
LED 3	yellow	Enable multifoc - “On” when the multifoc motor is driven or short-circuited (damaged). “Off” when the motor is set free.
LED 4	green	+5V-Powering - “On” when the switching regulator is working.





Control module

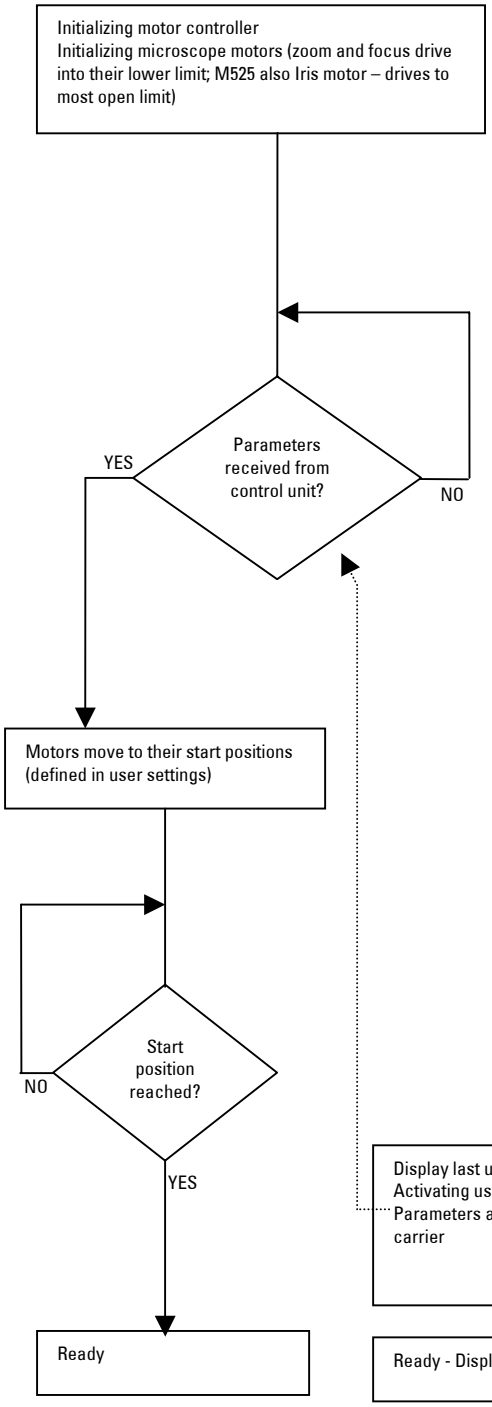
LED1	green	Watchdog LED - blinking when the main program is running.
LED2	red	Not used.
LED3	green	Indicates the presence of +5V.



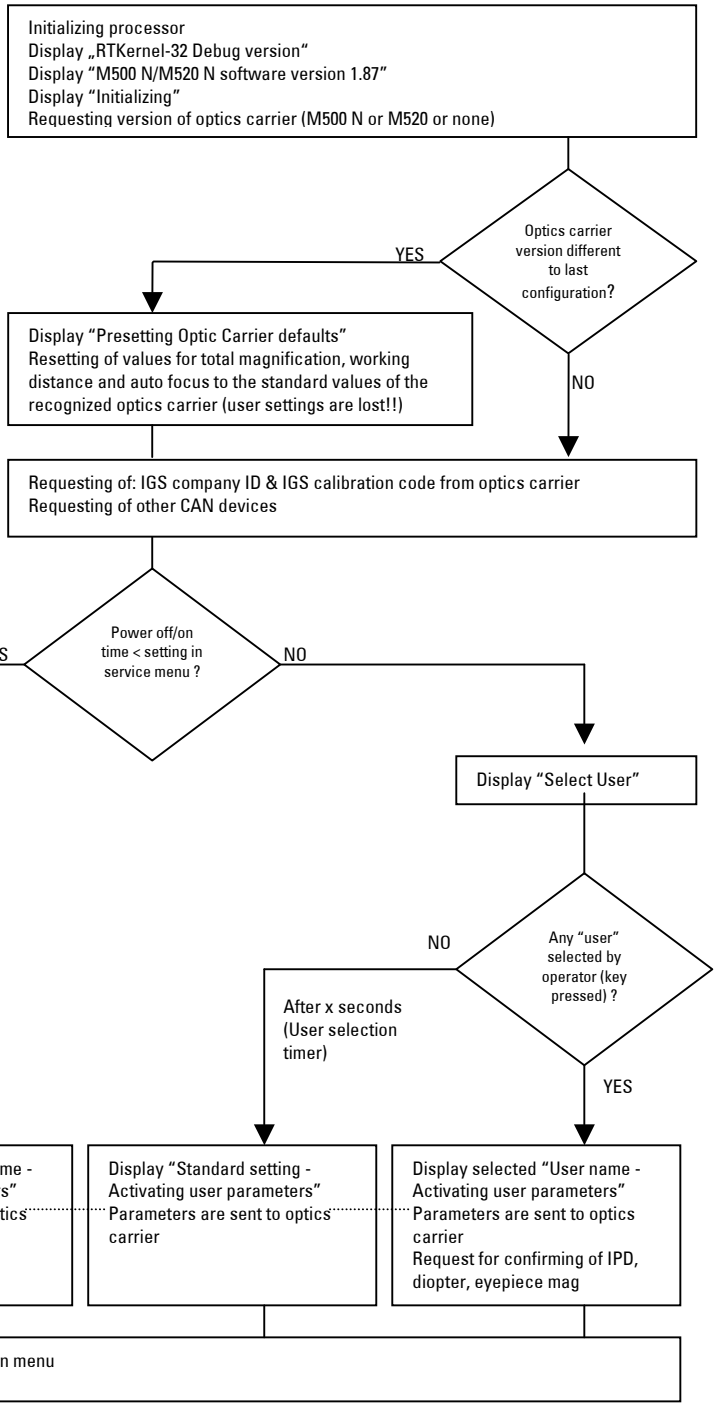
Start-up sequence

Validity
Below description refers to SW 1.87 in the control unit and 2.4 or 4.4 in optics carrier.

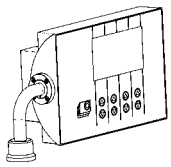
Optics-carrier:


Initializing motor controller
Initializing microscope motors (zoom and focus drive into their lower limit; M525 also Iris motor – drives to most open limit)
Parameters received from control unit?
YES
NO
Motors move to their start positions (defined in user settings)
Start position reached?
NO
YES
Ready

Control-unit:


Initializing processor
Display „RTKernel-32 Debug version“
Display “M500 N/M520 N software version 1.87”
Display “Initializing”
Requesting version of optics carrier (M500 N or M520 or none)
Optics carrier version different to last configuration?
YES
NO
Display “Presetting Optic Carrier defaults”
Resetting of values for total magnification, working distance and auto focus to the standard values of the recognized optics carrier (user settings are lost!!)
Requesting of: IGS company ID & IGS calibration code from optics carrier
Requesting of other CAN devices
Power off/on time < setting in service menu ?
YES
NO
Display “Select User”
Any “user” selected by operator (key pressed) ?
NO
YES
After x seconds (User selection timer)
Display last user “User name - Activating user parameters”
Parameters are sent to optics carrier
Display “Standard setting - Activating user parameters”
Parameters are sent to optics carrier
Display selected “User name - Activating user parameters”
Parameters are sent to optics carrier
Request for confirming of IPD, diopter, eyepiece mag
Ready - Display of the main menu

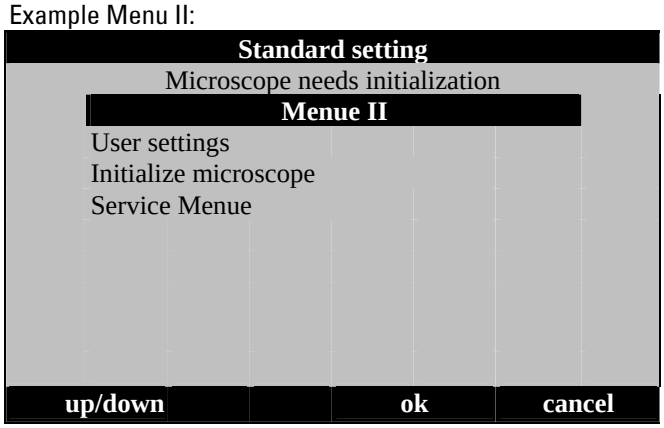
Error messages



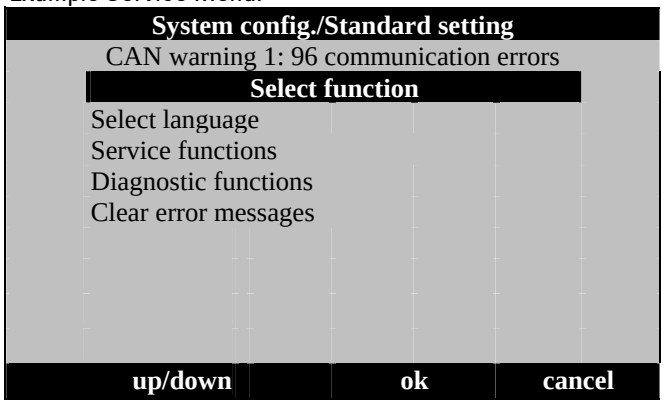
Error messages are displayed on the control unit. For systems without using the control unit - like M525 OH4 – refer to the appropriate service manuals (chapter fault finding and service programs).

Different levels of error messages

Level-1 error messages:
If a Level-1 error-message occurs, it will be shown in the second line of Menu I or Menu II.
The error message persists unless an appropriate action has been performed. If more than one error messages are present, then each message is visible for a few seconds in an endless loop.
Example Menu II:



Level-2 error messages:
If a Level-2 error-message occurs, it will be shown in the second line in the Service Menu. Level-1 messages are displayed here as well.
The error message persists unless an appropriate action has been performed – or the message has been cleared in the service menu. If more than one error messages are present, then each message is visible for a few seconds in an endless loop.
Example Service Menu:



Error list in diagnostic menu
All error-messages are stored in an error-list. How to display the error list - refer to chapter "Diagnostic function control unit".

Error interpretation
Restrictions and remarks:
Below description refers to SW 1.87 in the control unit and 2.4 or 4.4 in optics carrier.
Error messages caused by the Iris diaphragm in M525 optics carrier are NOT displayed in M500 N / M520 control unit.
Level-1 messages are underlined, all others are Level-2 messages.
MF means multifoc controller / motor controller .

Error messages caused by the **optics carrier**:

Error message	Description	Remedy
Microscope error/warning out of range	Control unit received an unknown error code from optics carrier.	Check compatibility of software in control unit with software in optics carrier.
Microscope needs initialization	Power-up-reset happened to optics carrier; therefore motor positions are not defined.	Release "initialize microscope" in menu II.
Microscope initialization failed	Initializing command, sent to optics carrier, is not executed within 45 seconds.	If no problem with CAN communication it is a problem of motor controller in optics carrier.
Activating user parameter failed	Motor positioning commands, sent to optics carrier, are not executed within 45 seconds.	If no problem with CAN communication it is a problem of motor controller in optics carrier.
No status response from microscope	No status response from optics carrier within 5 seconds.	If no problem with CAN communication it is a problem of motor controller in optics carrier.
Microscope detected (config. error)	Optics carrier was found on CAN bus, although it is set to NOT PRESENT.	Set optics carrier in device list PRESENT.
Microscope not detected (config. error)	Optics carrier was not found on CAN bus, although it is set to PRESENT.	Set optics carrier in device list NOT PRESENT.
IGS Calibration Code setting error	Problem writing IGS calibration code to optics carrier.	• SW in optics carrier must be 2.4 or higher • No reply from IGS workstation on CAN bus • Code does not match with calibration code of IGS workstation
MF: CAN 96 communication errors	More than 96 transmission errors did occur on CAN bus; bus communication is launched again.	• Check CAN cables • Electronic problem on CAN controller like inaccurate bit rate or faulty bus transceiver chip.
MF: Watchdog expired, rebooted	Watchdog expired – program crashed; resulting in power-up boot.	As long as position counters did not loose their values, normal operation possible. Else release "initialize microscope" in menu II.

Error message	Description	Remedy
MF: Zoom unexpected stop	End position of zoom motor was reached untimely.	Reason can be increased friction of mechanic or motor problem.
MF: Focus unexpected stop	End position of focus motor was reached untimely.	Reason can be increased friction of mechanic or motor problem.
MF: CAN bus restarted	More than 256 transmission errors did occur on CAN bus; CAN controller chip is initialized again and bus communication is launched again.	• Check CAN cables • Electronic problem on CAN controller like inaccurate bit rate or faulty bus transceiver chip.
MF: Error while installing CAN objects	Required amount of CAN objects could not be installed.	Electronic problem on motor controller: defect of CAN controller chip
MF: Zoom end position not reached	Could not reach end position of zoom, therefore position counter is not properly set.	Reason can be increased friction of mechanic or motor problem.
MF: Focus end position not reached	Could not reach end position of focus, therefore position counter is not properly set.	Reason can be increased friction of mechanic or motor problem.
MF: Zoom position error	Could not reach required zoom position.	Reason can be increased friction of mechanic (or manipulation on emergency drive knob) or motor problem.
MF: Focus position error	Could not reach required focus position.	Reason can be increased friction of mechanic (or manipulation on emergency drive knob) or motor problem.
Iris init pos not reached (No 107)	Iris motor could not reach end position.	Mechanical problem in Iris assembly.
Unexpected Iris stop (No 125)	End position of Iris motor was reached untimely.	Reason can be increased friction of mechanic or motor problem.

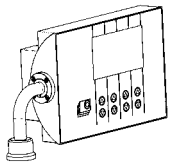
Relevant error messages caused by the **control unit** (basic SW errors are not listed):

Error message	Description	Remedy
CAN warning 1: 96 communication errors	More than 96 transmission errors did occur on CAN bus; bus communication is launched again.	• Check CAN cables • Electronic problem on CAN controller like inaccurate bit rate or faulty bus transceiver chip.

Error message	Description	Remedy
CAN warning 2: 256 communication errors	More than 256 transmission errors did occur on CAN bus; CAN controller chip is initialized again and bus communication is launched again.	• Check CAN cables • Electronic problem on CAN controller like inaccurate bit rate or faulty bus transceiver chip.
CAN error while installing objects	Required amount of CAN objects could not be installed.	Electronic problem on control module: defect of CAN controller chip
CAN invalid identifier or handle	Received unknown identifier.	Check compatibility of software in control unit with other connected devices.
Info: CAN transmit buffer not empty	Various internal reasons possible.	No serious problem as long as it does not occur together with „CAN transmit mailbox overflow“ and as long as it does not occur often.
EEROM invalid BCC, writing defaults	EEPROM checksum not valid.	EEPROM faulty.
Keyboard task watchdog error Footswitch task watchdog error Setup and display task watchdog error Status task watchdog error Display parameter task watchdog error CAN transmit task watchdog error Exception error reboot	Appropriate task crashed.	SW problem or external impacts (EMC)
No status response from stand	No status response from stand CAN controller within 5 seconds.	If no problem with CAN communication it is a problem of CAN controller in stand.
Stand detected (configuration error)	Stand was found on CAN bus, although it is set to NOT PRESENT.	Set stand in device list PRESENT.
Stand not detected (configuration error)	Stand was not found on CAN bus, although it is set to PRESENT.	Set stand in device list NOT PRESENT.
Autofocus detected (config.error)	Autofocus device was found on CAN bus, although it is set to NOT PRESENT.	Set autofocus in device list PRESENT.
Autofocus not detected (config.error)	Autofocus device was not found on CAN bus, although it is set to PRESENT.	Set autofocus device in device list NOT PRESENT.
Focus position (autofocus) not found	Autofocus device terminated cycle without detecting the optimal range.	Problem in autofocus devices
No remote response from autofocus	No status response from autofocus device within 3 seconds.	Problem in autofocus devices

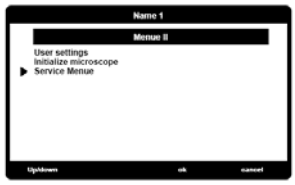
Error message	Description	Remedy
Timeout of autofocus function	Autofocus function was started, but no response about the cycle termination within 36 second.	Problem in autofocus devices
Set CAN Handle R in device list	CAN Handle R was found on CAN bus, although it is set to NOT PRESENT.	Set CAN handle R in device list PRESENT.
Set CAN Handle L in device list	CAN handle L was found on CAN bus, although it is set to NOT PRESENT.	Set CAN handle L in device list PRESENT.
CAN Handle R not detected	CAN handle R was not found on CAN bus, although it is set to PRESENT.	Set CAN handle R in device list NOT PRESENT.
CAN Handle L not detected	CAN handle L was not found on CAN bus, although it is set to PRESENT.	Set CAN handle L in device list NOT PRESENT.
Set DI-Controller in device list	DI-Controller was found on CAN bus, although it is set to NOT PRESENT.	Set DI-Controller in device list PRESENT.
DI-Controller not detected	DI-Controller was not found on CAN bus, although it is set to PRESENT.	Set DI-Controller in device list NOT PRESENT.
DI-Controller shutter position error	Detected position of shutter does not correlate with commanded position for more than 5 seconds.	Problem in DI-Controller / DI C module.
DIC500: Video signal not valid	Video signal not valid or PLL not engaged.	• Check video signal • Check VESA settings
DIC500: detected (config. error)	DI-Color LCD module was found on CAN bus, although DI controller is set to NOT PRESENT.	Set DI controller in device list PRESENT.
DIC500: not detected (config. error)	DI-Color LCD module was not found on CAN bus, although DI controller is set PRESENT.	Set DI controller in device list NOT PRESENT.
Imaging position sensor error	Image position sensor indicates that prism is not in left or right end position.	• Engage rotary knob for image left/ right to left or right end position. • Else defective sensor in DI-C module.
Stand not available	Setup- or diagnostic menu of stand was called up, but stand does not respond.	• Stand not present • Failure in CAN cabling • Failure in stand CAN controller
Stand is busy	Setup- or diagnostic menu of stand was called up while stand is busy (for example during auto balance procedure).	Wait until stand is ready and repeat call up.
Stand error pending, enter diagnose	Setup menu of stand was called up, although an error of the stand is pending.	Confirm stand error in diagnostic menu and repeat call up.

Diagnostic functions control unit



The M500 N / M520 / M525 control unit is equipped with diagnostic functions (below description refers to SW 1.87 in the control unit; earlier versions do contain less functions). For systems without using the control unit - like M525 OH4 – refer to the appropriate service manuals (chapter fault finding and service programs).

How to enter the diagnostic functions:
Select [Menue II]
Select [Service Menue]
Enter the security code: 6642
Select [Diagnostic functions]



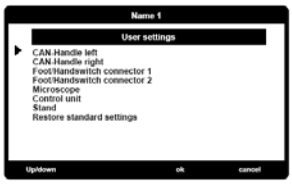
Available diagnostic function	**Description**
Keyboard test	All push-buttons on the keyboard can be tested.
Check CAN-Handle switches	Keys pressed on the right CAN-handle are displayed.
Show/clear error list	Appearing errors are stored in this list, up to 29 lines; clear list after repair/service. Refer to chapter "error messages".
Show parameters	Different parameter of the control unit can be asked for: Software version: 1.87 Boot code version: 1.05 Internal temperature: 35 Configuration size: 1831
Microscope: Max encoder positions	The zoom motor and the focus motor drive to their max. range and return

Microscope:	show parameters	connected optics carrier:	M500N	M520	M525
		Optics carrier:	M500N	M520N	M520N
		Software version:	2.4	2.4	4.4
		supply voltage:	23.8		
		Zoom encoder (min/max):	1000/28321		
		Focus encoder (min/max):	1000/24109		
		IGS Company ID :	xxx		
		IGS Calibration Code:	xxxxx		

Autofocus : show parameters	Status of an optional autofocus is displayed.
Stand diagnose:	Opens a monitor for entering diagnosis programs of optional connected stand systems.
Swing carrier: show parameters	Status and version of a connected swing carrier are displayed.

CAN-handles: show parameters	HW and SW version of left and right CAN handle are displayed.
DI-controller: show parameters	Status and version of a connected DI C500 module are displayed.
DI-controller: test shutters	Shutters of a connected DI C500 module can be activated and monitored.
DI-LCD-module: show parameters	Status and version of the LCD module of a connected DI C500 module are displayed.
IGS-Workstation: show parameters	Status and version of a connected IGS system are displayed.

Test and diagnosis in the user menu:
Select [Menue II]
Select [User settings]



Available test function	**Description**
CAN-Handle left/right	All keys of the appropriate handle can be checked; the standard setting of the handles can be displayed.
Foot/handswitch connector 1 / 2	All keys of the appropriate foot/handswitch can be checked; the standard setting of the foot/handswitch can be displayed.
Microscope	Speed and position of focus or zoom can be displayed.
Control unit	Setting of screen brightness and contrast ca be displayed.
Stand	All keys of the stand handgrips (Not CAN-handles!) can be checked; the standard configuration of the handgrip can be displayed.
Restore standard settings*	Overwrite the actual user with default settings.

*not visible when standard settings are activated

5 Replacing modules - Leica M500 N, M520, M525

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5 Replacing modules

5.1 Dismantling / assembling the optics carrier

5.1.1 Removing motor controller board

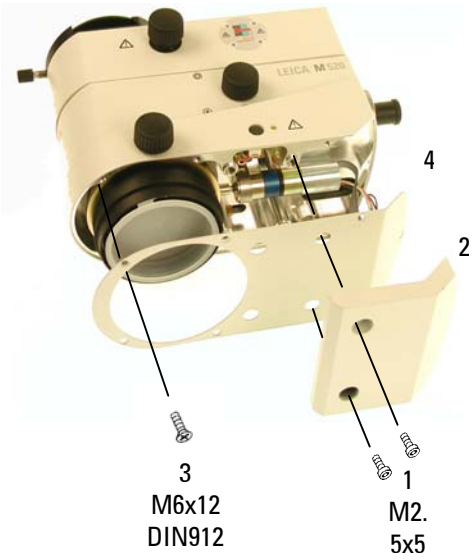


Fig. 1

1. Remove two screws [Fig.1-1] from counter weight [Fig.1-2] and take it off
2. Remove seven screws [Fig.1-3] from lower cover [Fig.1-4] and take it off.

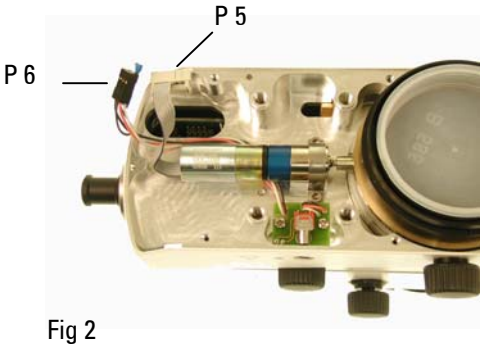


Fig 2

3. Pull out connectors P5 and P6 [Fig.2] from motor controller board.

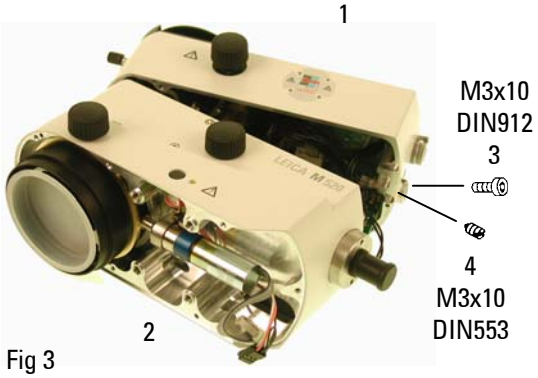


Fig 3

4. Separate upper part of zoom [Fig.3-1] from the illuminators lower part [Fig.3-2], remove screws [Fig.3-3] and [Fig.3-4] until they no longer engage.
   Note: *the upper screw [Fig 3-3] is a safety screw.*

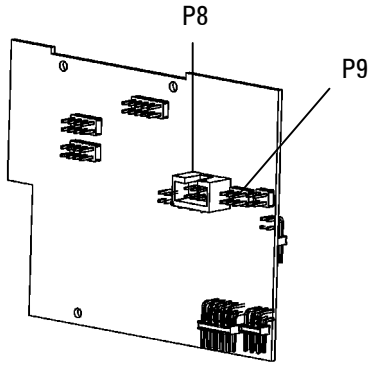


Fig. 3A

4A. For **M525** only: Carefully swing away illuminator [Fig.3-2] Downwards, over dovetail segment until P8 and P9 become accessible. Pull out connectors P9 and P8 from motor controller board (Fig 3A).

5. Carefully swing away illuminator [Fig.3-2] downwards, over dovetail segment.

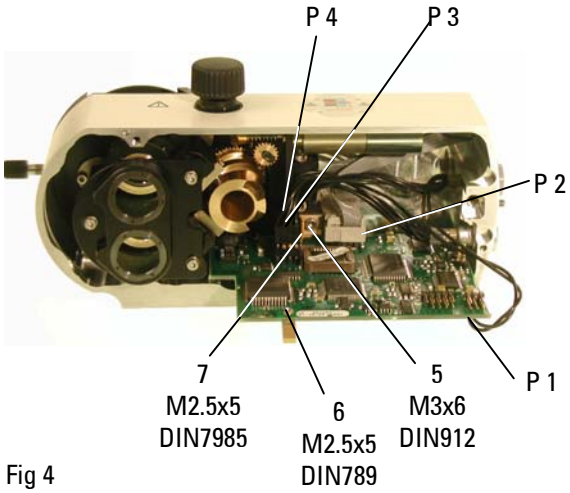


Fig 4

6. Pull out connectors P1, P2, P3 and P4 from motor controller board.

7. Remove screw [Fig.4-5] from zoom motor adapter and remove motor controller board from zoom part [Fig.3-1].

8. Remove screw [Fig.4-6] from motor controller board positioned and take it off.

9. Remove two screws [Fig.4-7] from motor controller board carrier and take it off.

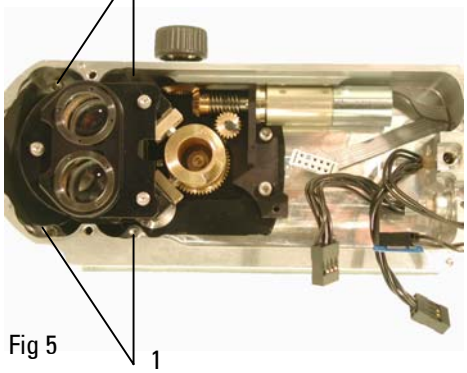
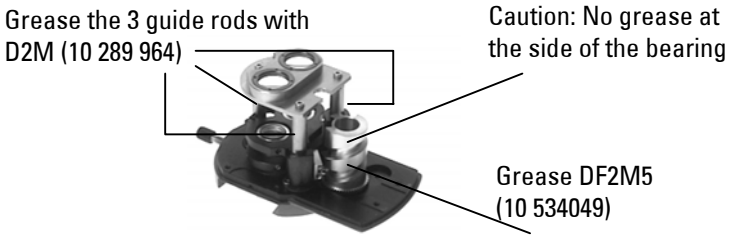


Fig 5

5.1.2 Removing the zoom carrier

1. Separate zoom (upper part) and illuminator (lower part) from one another as described in paragraph 5.1.1.

2. Remove four screws [Fig.5-1 and 5-2] from the zoom (see Fig. 6-2) and take out the complete zoom mechanism [Fig.6-2] slantwise upwards from zoom housing.



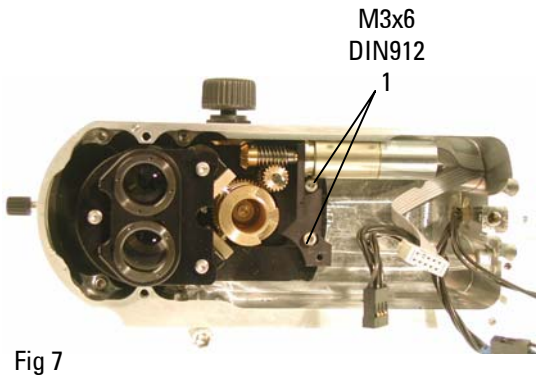


Fig 7

5.1.3 Removing the zoom motor

1. Separate zoom (upper part) and illuminator (lower part) from one another as described in paragraph 5.1.1.
   Zoom does not need to be removed from the zoom housing (upper part).
2. Remove two screws [Fig.7-1] from zoom carrier.

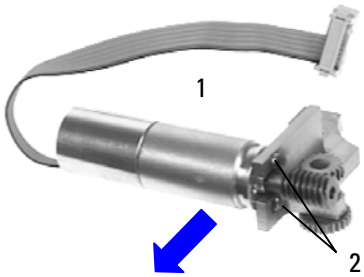


Fig 8

3. Remove zoom motor completely with motor adapter and gears [Fig.8-1], from zoom carrier.
4. Remove two screws [Fig.8-2] from motor adapter and take out the zoom motor sideways through the slit.

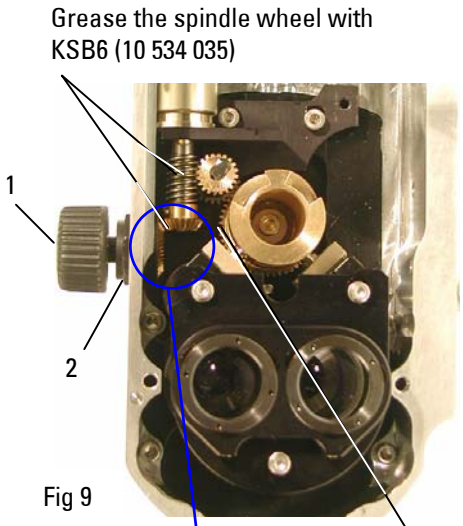


Fig 9

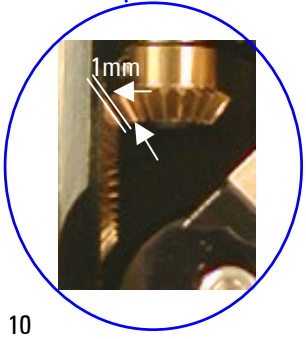


Fig 10

5.1.4 Exchange the set manual zoom drive

1. Separate zoom (upper part) and illuminator (lower part) from one another as described in paragraph 5.1.2
2. Remove the knob [Fig.9-1] from the manual zoom drive.
3. Remove the manual zoom drive 10711530 with the nut [Fig.9-2] using a 16mm fork wrench.
4. Fix the manual zoom drive 10711530 with a 16mm fork wrench.
5. Adjust a 1mm space [see Fig.10] between the two bevel gear wheels with the nut [Fig.9-2] using a 16mm fork wrench.

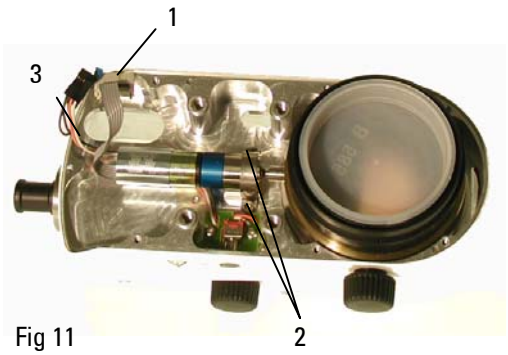


Fig 11

5.1.5 Removing the multifocal motor

1. Remove counter weight and lower cover as described in paragraph 5.1.2.
2. Pull out motor connector P5 [Fig.11-1] from motor controller board through the notch in the illuminator (lower part).
3. Loose two screws [Fig.11-2] of motor-holding clip.
4. Take out the motor sideways from motor-holding clip.

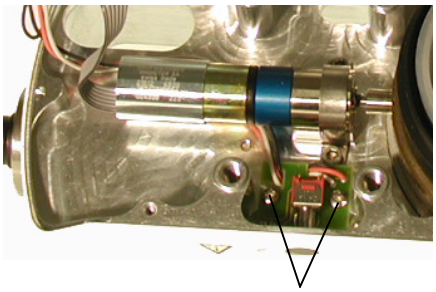


Fig 12

5.1.6 Removing the switchboard

1. Remove counter weight and lower cover as described in paragraph 5.1.2.
2. Pull out the switchboard plug P6 (Fig 11-3) from motor controller board through the notch in the illuminator (lower part).
3. Remove two screws [Fig.12-1] of the switchboard and remove switchboard in direction of the motor.

5.1.7 Removing the multifocal objective (10 712 073) from the illumination device (10 712 092)

1. Remove counter weight and lower cover as described in paragraph 5.1.2.
2. Pull off connectors from motor controller board as describes in paragraph 5.1.1.
3. Separate zoom (upper part) and illuminator (lower part) from one another as described in paragraph 5.1.1.
4. Loose the two screws (Fig 13-1) of the motor holding clip.

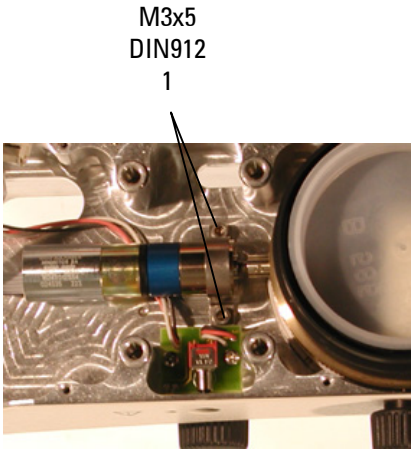


Fig 13

5. Take out the motor sideways from motor holding clip until no more affect the gear rim from multifocal.

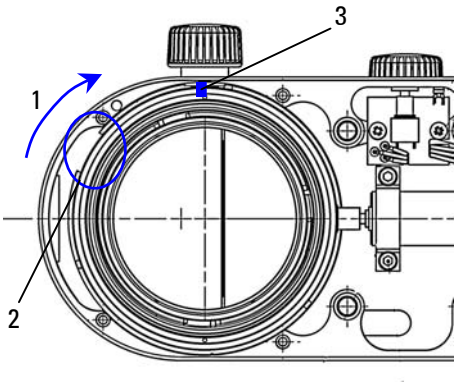


Fig 14

6. Turn (Fig 14-1) the multifocal that the groove (Fig 14-2) is underneath the axis of the manual drive (Fig 17-3)

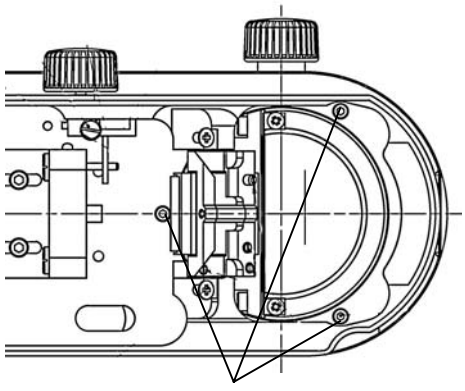


Fig 15

7. Loose the 3 screws of the multifocal (Fig 15-1) and take out the multifocal sideways.

5.1.8 Removing Iris switch

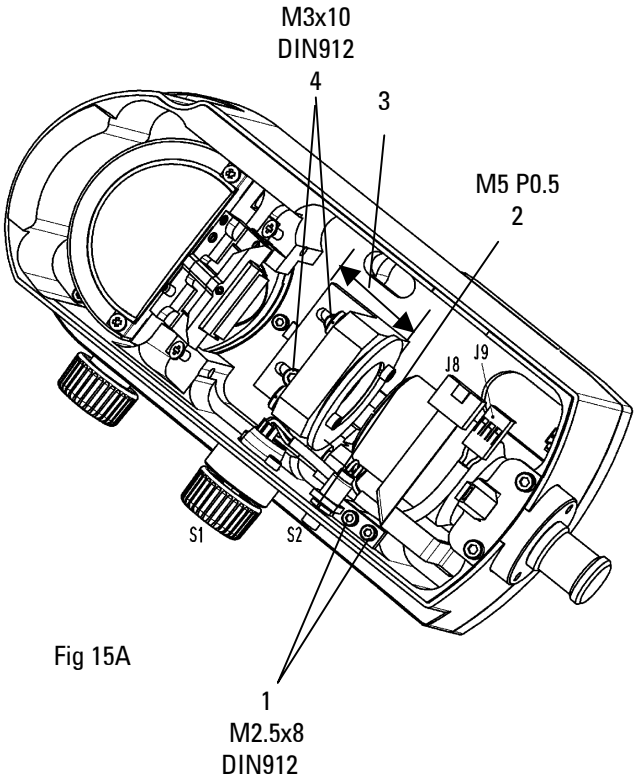


Fig 15A

1. Remove upper from lower part (step 1 to 5 in 5.1.1)
2. Release switch S2: loosen 2 screws (Fig 15A-1) and hex nut (Fig 15A-2).
3. Mark axial position of Iris assembly in housing (Fig 15A-3).
4. Loosen 2 screws (Fig 15A-4) and remove Iris assembly with motor.
5. Release switch S1: remove cap of plastic cover and loosen hex nut (M5 DIN 439), remove cover. Loosen hex nut of S1 (1/4-28).

5.1.9 Assembly of Iris switch

Reversed order of 5.1.8: put Iris assembly to former position. Secure screws Fig 15A-4, 2, 1 with shellac.

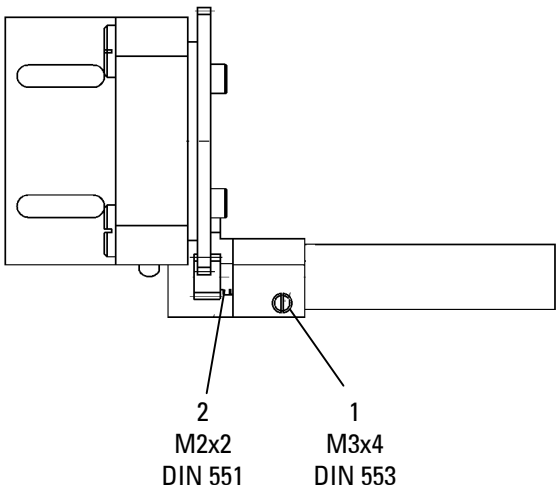


Fig 15B

5.1.10 Removing Iris motor

1. Perform procedure 5.1.8 step 1 to 4.
2. Dissolve shellac of pin screw (Fig 15B-1) with solvent (alcohol, spirit) and pull out motor.
3. Dissolve shellac of pin screw (Fig15B-2) with solvent and remove gear.

5.1.11 Assembling Iris motor

1. Perform procedure 5.1.10 in reversed order.
2. Secure screws (Fig 15B-1, Fig 15B-2) with shellac. Grease gear with FM5 (10 289 967).

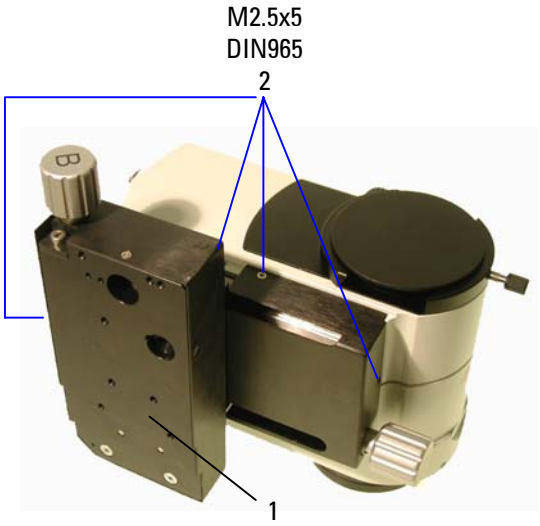


Fig 16

5.2. Removing the A/B-slide

1. Removing the optics carrier.
2. Move B-slide [Fig.16-1] to rear position (turn A-spindle).
3. Remove front cover and rear cover from A-slide by taking out the four screws [Fig.16-2].

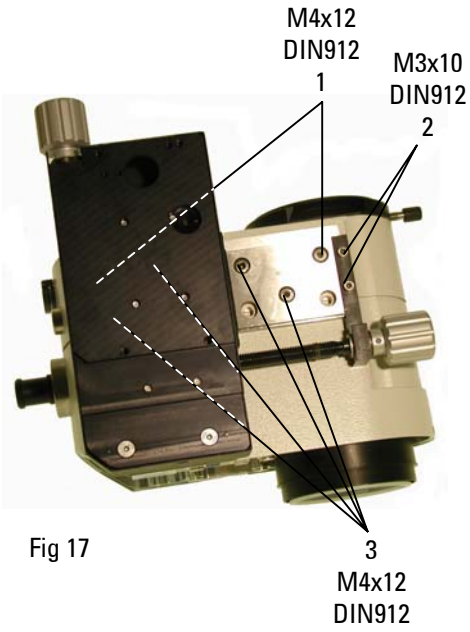


Fig 17

4. Remove only first and last screw [Fig.17-1] from A-slide.
5. Remove two screws [Fig.17-2] to release A-carrier from zoom (upper part)

***Note**: Prevent the slide [Fig.18 –1 and 2] (front and rear) from accidentally coming out of its guidance.*

6. Remove last four screws [Fig.17-3] to release A/B-slide from zoom upper part.

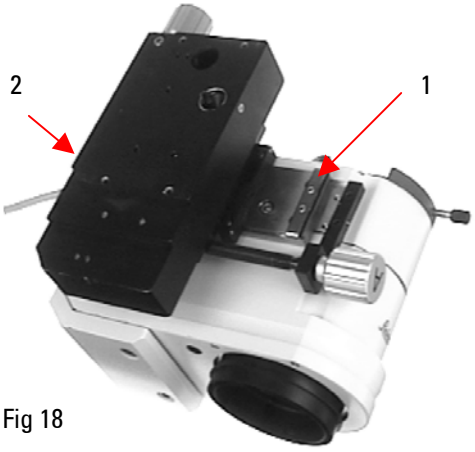


Fig 18

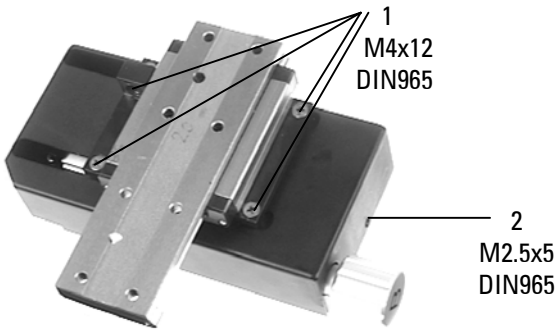


Fig 19

7. Remove four screws [Fig.19-1] and four washers [Fig.20-1] to release A-slide from B-slide.

8. Remove three screws [Fig.19-2] to release cover from B-slide.

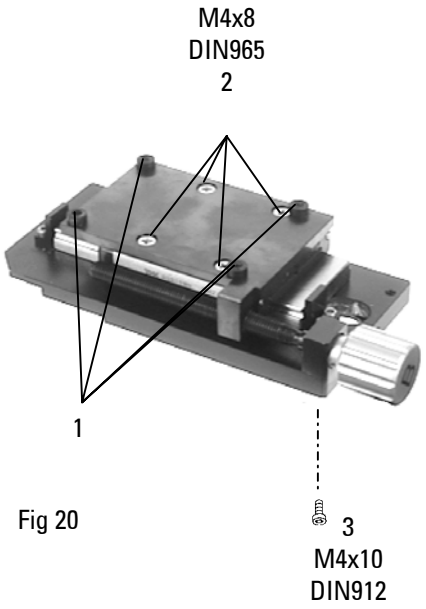


Fig 20

9. Remove four screws [Fig.20-2] and one screw [Fig.20-3] to release B-carrier from B-slide.

10. Assembly in reverse order.

6. Maintenance - Leica M500 N, M520, M525

General guidelines maintenance

Instruments and their accessories are generally exposed to dust and dirt.
Each time, before you use them, carry out an external inspection of accessible mechanical and optical parts such as eyepieces, optics carrier, objectives, binocular tubes and accessories; clean them if necessary.
Dust and dirt have a negative effect on the results of your work.
When the instruments are not in use, use the dust covers and dust plugs provided.

Specific guideline for the Leica M500 N / M520 /M525

We recommend to do a preventive maintenance every 3 years.

Maintenance work:
Dismantling the modules of the optics carrier in accordance with procedures described in section 5 of the service manual.

Cleaning and re-greasing of the individual dismantled optical and mechanical modules.

Performing a complete inspection according to chapter 7 of this manual.

Perform maintenance work for tubes and accessories in accordance with the appropriate service manuals.

7. Inspection Leica M500 N, M520, M525

Table of content

Chapter	Page
Inspection list / entries	7-3
Test certificate	7-8

Inspection Leica M500 N, M520, M525

Remarks
The following inspection list is an addition to the inspection list of the connected stand system.
Exceptions for the inspection of the control unit: OH4 and future stand systems do/might not use the M500 N control unit, for such systems skip below steps 2.x and refer to particular stand inspection.

Entries

Step	Description	Required results	O.K.	Fails
1	**General**			
	WARNING! Never do look directly in to the light source!			
1.1	Switch stand system on.	Optics carrier and control unit perform the start-up sequence. No error messages on the control unit.		
2	**Control unit**			
2.1	Display the list of errors in the service menu/ diagnostic functions(6642). Note and erase error messages.	No error messages are stored.		
2.2	Check the arrow and display key in the submenu [Keyboard test]	Keys are in proper condition.		
2.3	Connect a foot- or hand switch to control 1 connector and select diagnostic function for foot/hand switch connector 1	Pressed keys of connected switch are recognized in the menue.		

Step	Description	Required results	O.K.	Fails
2.4	Connect a foot- or hand switch to control 2 connector and select diagnostic function for foot/hand switch connector 2	Pressed keys of connected switch are recognized in the menue.		
2.5	Activate additional function 1 (use foot/hand switch with appropriate configuration)	Relay contact on additional function 1 connector is activated (resistance < 1 Ohm when activated).		
2.6	Activate additional function 2 (use foot/hand switch with appropriate configuration)	Relay contact on additional function 2 connector is activated(resistance < 1 Ohm when activated).		
2.7	Check screen brightness and contrast: Use arrow keys in menu "User-settings/control unit/screen brightness and contrast"	Brightness and contrast can be increased and decreased from minimum to maximum; the ideal values are intermediate.		
2.8	Check CAN cable	CAN cable seems undamaged and does not limit the movement of the control unit.		
2.9	Check eyepiece magnification setting in user settings	Setting corresponds to magnification of normally used eyepieces; default 10x		
2.10	Check tube focal length setting in service menue	Setting corresponds to focal length of normally used tube; default f=170mm		
2.11	Check device list in service menue	Setting corresponds to normally connected devices		
2.12	Read out controller parameter in diagnostic functions/show parameter	SW version: Boot code version: V1.05 Internal temperature: Nominal app. 50°C (after warm-up)		

Step	Description	Required results	O.K.	Fails
2.13	Check software compatibility	Allowed combinations: Control unit 1.87 – optics carrier 2.4 and 4.4 Control unit 1.81 – optics carrier 2.4 Control unit 1.84 – optics carrier 2.4 Control unit 1.76 – optics carrier 2.4 Control unit 1.54 – optics carrier 2.3 Control unit 1.40 – optics carrier 1.4		
2.14	Select main menue and use cursor keys to change focus speed, zoom speed, zoom magnification and working distance (WD).	Values can be changed as required: Focus and zoom speed: 1…100% Magnification* and working distance: **M500 N optics carrier** 1.4 (at WD max 407) to 13.7 (at WD min 207) **M520, M525 optics carrier** 1.2 (at WD max 470) to 12.8 (at WD min 207) *for eyepiece magnification 10x and tube focal length 170mm		
3	**M500 N / M520 / M525 optics carrier**			
	Various			
3.1	Inspect optics.	Optics clean.		
3.2	Check interface for protective glass.	Protective glass fits properly.		
3.3	Check dovetail interface.	Tube fits properly.		
	A/B slide			
3.4	Inspect A- and B slide.	Smooth movement through entire range: A= min 63mm, B= min 42mm		
3.5	Load available equipment onto optics carrier and perform manual balancing of A/B axis.	Microscope is balanced in A/B axis.		
	Focus functions			
3.6	Press focus up button at left and right handle.	**M500 N:** Working distance (WD) increases to 407 **M520 & M525:** Working distance (WD) increases to 470, the WD indication on optics carrier is equivalent to WD display on control unit.		

Step	Description	Required results	O.K.	Fails
3.7	Press focus down button at left and right handle.	Working distance decreases to 207. **M520 & M525:** WD indication on optics carrier is equivalent to WD display on control unit.		
3.8	Observe movement of focus	Uniform focus movement at both, min and max speed (32sec....8sec).		
3.9	Turn emergency drive knob of focus.	Display of WD on control unit and on optics carrier indicate changes from turning knob.		
3.10	Press switch for laser application.	Yellow LED beside of the switch shines. Handle switches and arrow keys of control unit cannot alter working distance anymore.		
	Zoom functions			
3.11	Press zoom up button at left and right handle.	Magnification increases.		
3.12	Press zoom down button at left and right handle.	Magnification decreases.		
3.13	Observe movement of zoom.	Uniform zoom movement at both min and max speed (12sec...5sec).		
3.14	Turn emergency drive knob of zoom.	Display of magnification on control unit indicates changes from turning knob.		
	Controller			
3.15	Determine the max. focus/zoom encoder positions (diagnostic functions/Microscope: max. encoder positions)	Both motors, zoom and focus, travel to the maximum position and return.		
3.16	Read out controller parameter (diagnostic functions/microscope/show parameters in control unit);	Optics carrier: (M500N or M520N*) SW version: Voltage supply: (24V +/- 0.6V) Zoom encoder min/max: (min=1000 / max=28400 nominal)** Focus encoder min/max: (min = 1000 / max=24200 nominal)** * if M525 optics carrier is connected, it shows M520N ** no tolerances defined		

Step	Description	Required results	O.K.	Fails
	Illumination			
3.17	Inspect fibre optics cable and its connectors for damages.	Seem to be intact, no dots in fibre.		
3.18	Plug and unplug fibre optics.	Fibre optics does snap in noticeable.		
3.19	Switch on light source, dim moderate intensity.	Field of view is illuminated.		
3.20	Observe field of illumination at WD=207mm and max. magnification; set diaphragm to maximum.	No reflexes, no disturbing stray light in field of view, homogeneous illumination in the field of view.		
3.21	Observe field of illumination at WD=207mm and min. magnification; set diaphragm to maximum.	No reflexes, no disturbing stray light in field of view, Gaussian distribution of illumination in the field of view; the light spot is in centre of field of view.		
3.22	Check autoIris function (M525 only): Press autoIris reset button and increase/decrease zoom.	Light field diameter is automatically following the size of the visual field, but always slightly bigger. (Diameter is around 29mm at WD250 and maximum zoom)		
3.23	Check Iris diaphragm diameter at WD 250, position optics carrier to a sharp image; set diaphragm to minimum by rotary button.	Diameter of illumination circle measured in object plane: 11mm +/- 1.5mm		
	Image			
3.24	Adjust parfocality, select a WD 320	Image is sharp throughout entire zoom range.		
3.25	Measure diameter of visible field of view in the object plane	Diameter field of view: WD at max and zoom at min: >170mm* WD at min and zoom at max: <18mm* *with 10x eyepieces and tube focal length 170mm		

Test certificate
Leica M500 N/M520/M525

	Select type: 0 M500 N 0 M520 0 M525	Leica Microsystems (Schweiz) AG Surgical Division CH-9435 Heerbrugg Switzerland
Date		
Purpose of test		

System Configuration

Serial no. of optics carrier		Stand OHS1/MS-1/MC-1/MS2/ MS3/OH3/F40/C40/CT40/OH4)	
Software version optics carrier		Serial no. of stand	
Serial no. of control unit		Software version stand	
Software version control unit		Serial no. of xenon unit	
		Mains voltage set on xenon unit	

performed inspection / steps:

Peculiarities of test

Inspected by	Date	Signature

8. Spare parts - Leica M500 N, M520, M525

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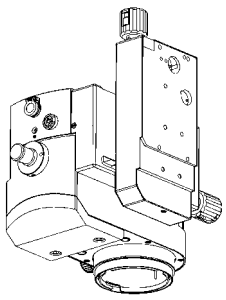
Stock n°	Description / Specification	Remark	Drawing

Stock n°.	Description / Specification	Remark	Drawing

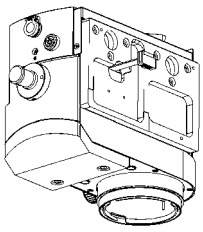
Spare parts – Leica M500 N, M520, M525

Optics carrier

Optics carrier exchange modules



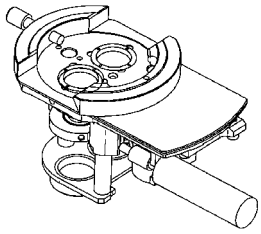
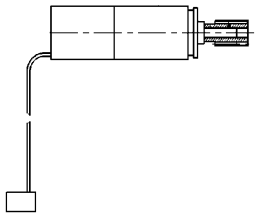
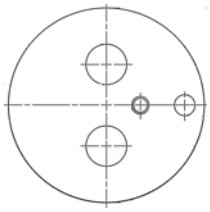
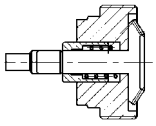
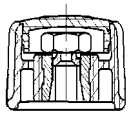
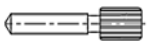
10 448 237R	Optics carrier M525 with A/B slide
10 448 029R	Optics carrier M520 with A/B slide
10 446 757R	Optics carrier M500 N with A/B slide
10 446 481R	Optics carrier M500 N with A/B slide

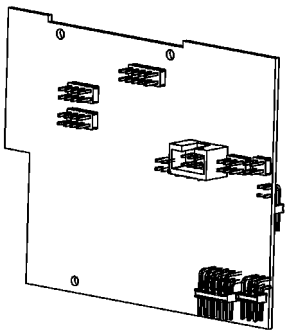
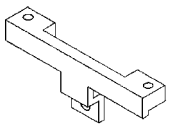


10 448 238R	Optics carrier M525 for OH4
10 448 035R	Optics carrier M520 for OH3
10 448 019R	Optics carrier M500 N for OH3

Stock n°	Description / Specification	Remark	Drawing

Zoom unit

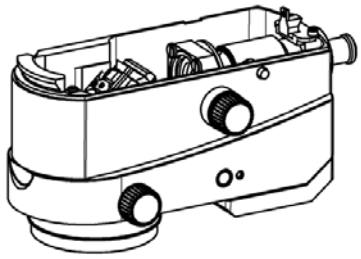
10 714 391	Zoom complete with motor	For M500N/M520/M525	
10 710 420	Zoom motor complete (motor, gearing, encoder)		
10 712 255	Lens aperture		
10 711 530	Set manual zoom drive without knob	Availabe on request only	
10 565 683	Rotary knob, complete	Set with different clamp chucks and nuts	
10 638 876	Threaded bolt		

Stock n°.	Description / Specification	Remark	Drawing
10 714 356	Motor controller with software 4.4 or higher (replaces former controller 10661250 of M520 and M500 N – but it requires the latest SW 1.87 in the control unit; upgrade parts have to be ordered on demand)		
10 704 396	Motor controller board carrier		
10 706 298	Motor controller board positioner		

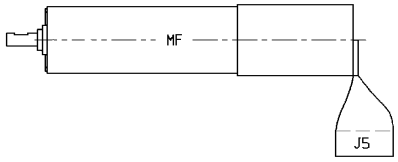
Stock n°	Description / Specification	Remark	Drawing

Focus/illumination unit

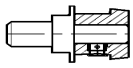
10 714 355R	M525 multifocus/illumination module	replacement part	
10 712 092R	M520 multifocus/illumination module	replacement part	
10 713 263R	M500 N multifocus/illumination module	replacement part	



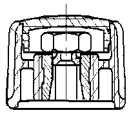
10 663 466	Focus motor with encoder		



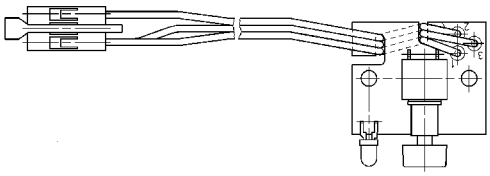
10 711 527	Set manual drive multi - focal objective	axis and bevel wheel	



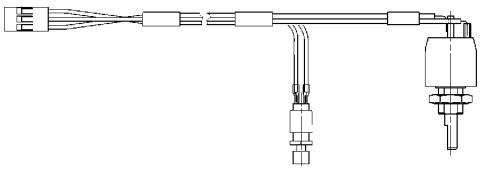
10 565 683	Rotary knob, complete	Set with different clamp chucks and nuts	

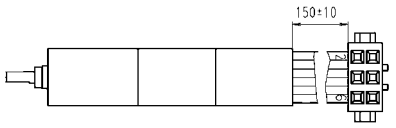
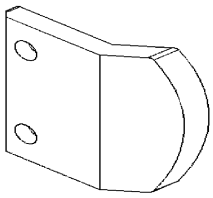


10 712 260	Switch board M520/M525	Configure for M500 N: remove bridge in connector	



10 714 365	Iris switch assembly M525	Rotary knob, pushbutton and wiring	



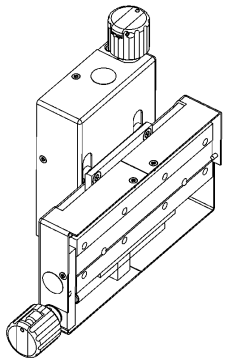
Stock n°.	Description / Specification	Remark	Drawing
10 714 366	Iris motor with encoder	M525 only	
10 712 158	Counterweight		

Stock n°	Description / Specification	Remark	Drawing

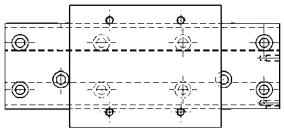
A/B slide

Remark: A/B slide parts for optics carrier 10448238: refer to service manual OH4, doc code 10 665 744

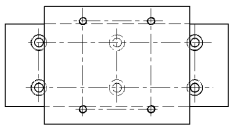
10 446 491 A/B slide



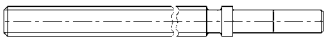
10 663 886 A slide



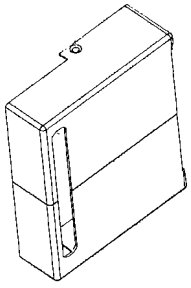
10 663 887 B slide



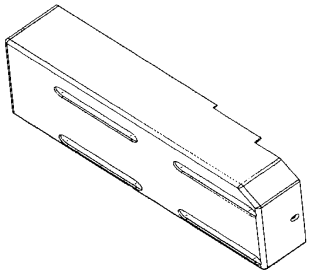
10 638 971 X-Spindle



10 663 892 A – cover



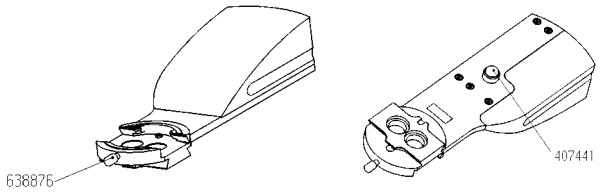
10 663 893 B – cover



Stock n°.	Description / Specification	Remark	Drawing

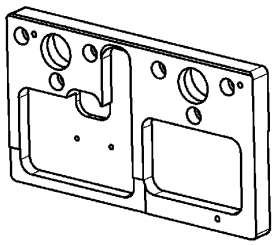
Various parts

10 446 570 Counterweight MTU205



10 714 358 Adapter plate OH4
10 711 883 Adapter plate OH3

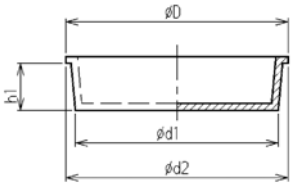
6x Allen screw M4x12 not included



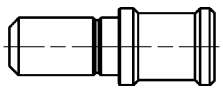
10 428 328 Drive knob cover

10 424 316 Protective cover for dovetail interface

10 704 102 Protective cover for multi – focal objective

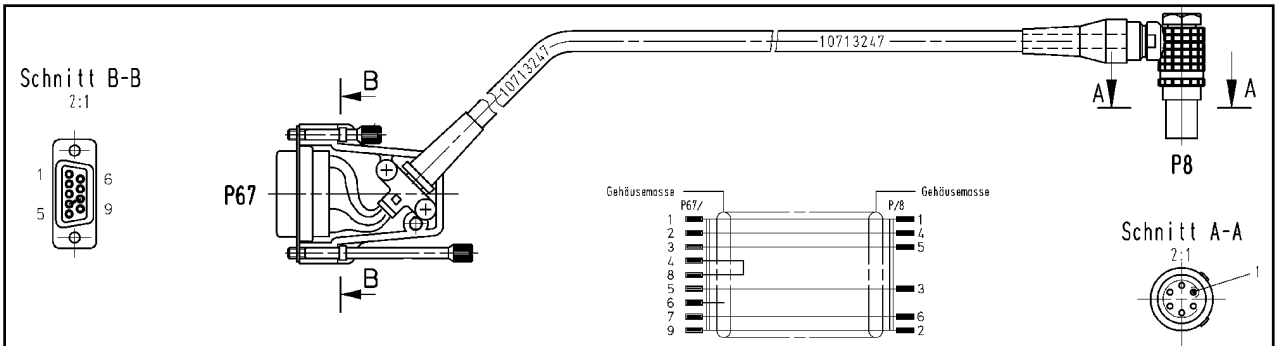


10 704 525 Collector protection

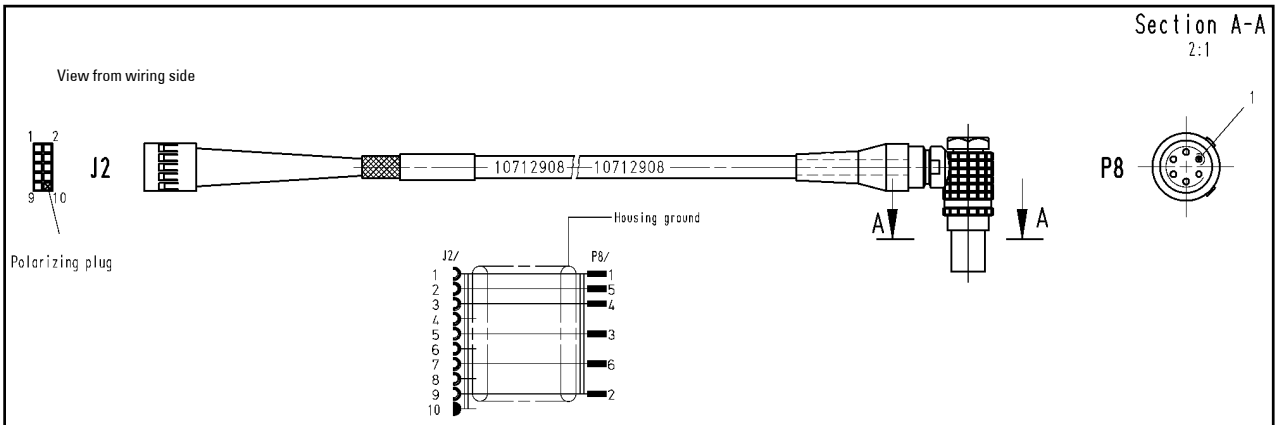


Stock n°	Description / Specification	Remark	Drawing

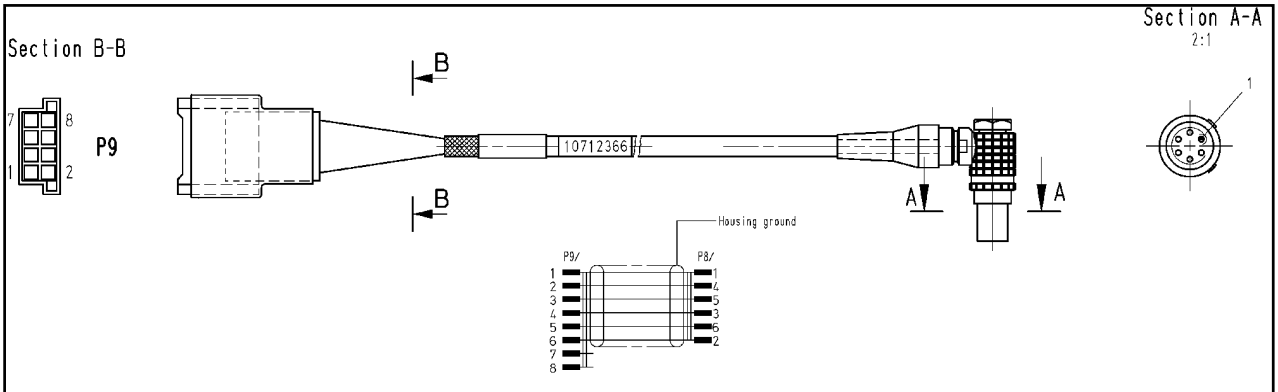
CAN cables



10 713 247	CAN cable to MC1 stand after 03/2005	length = 4200mm

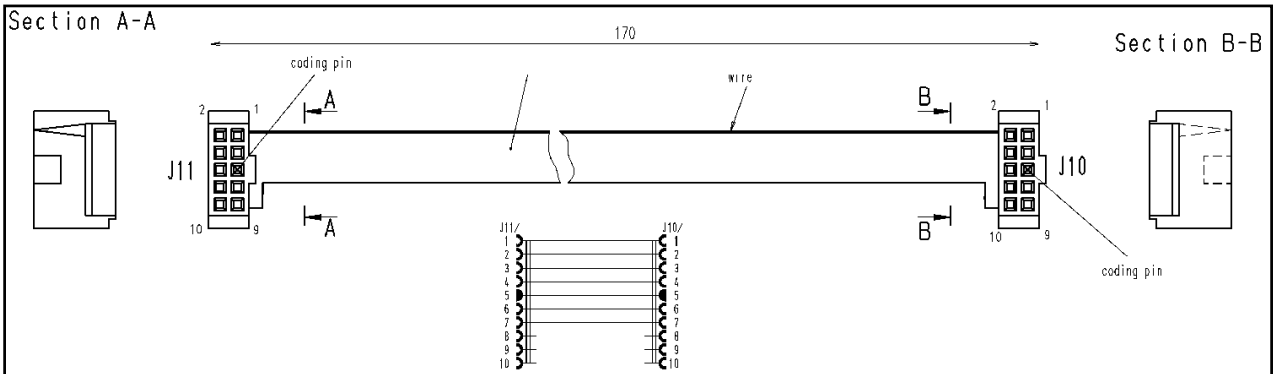


10 712 908	CAN cable to MS3 stand	length = 650mm

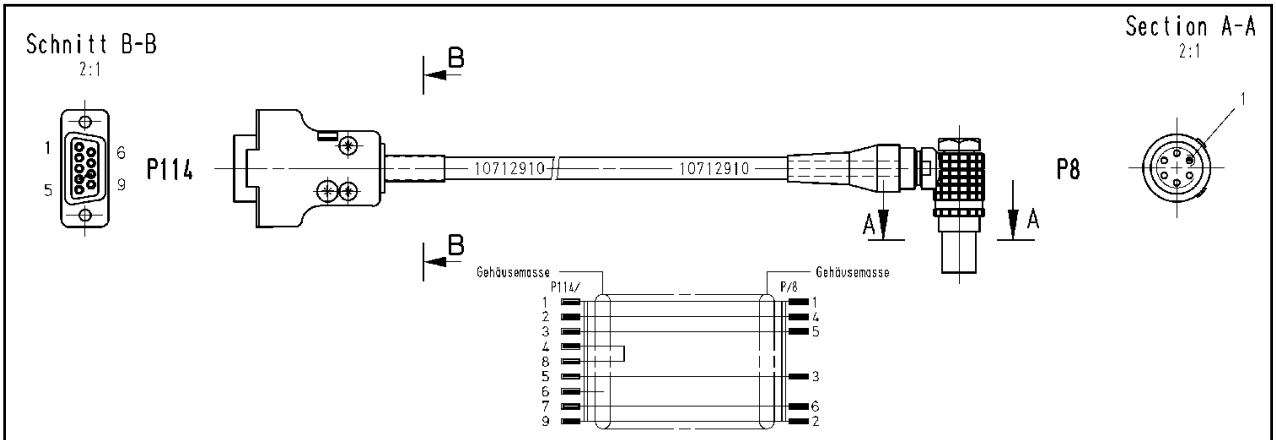


10 712 366	CAN cable to F40/C40/CT40 stand	length = 1000mm

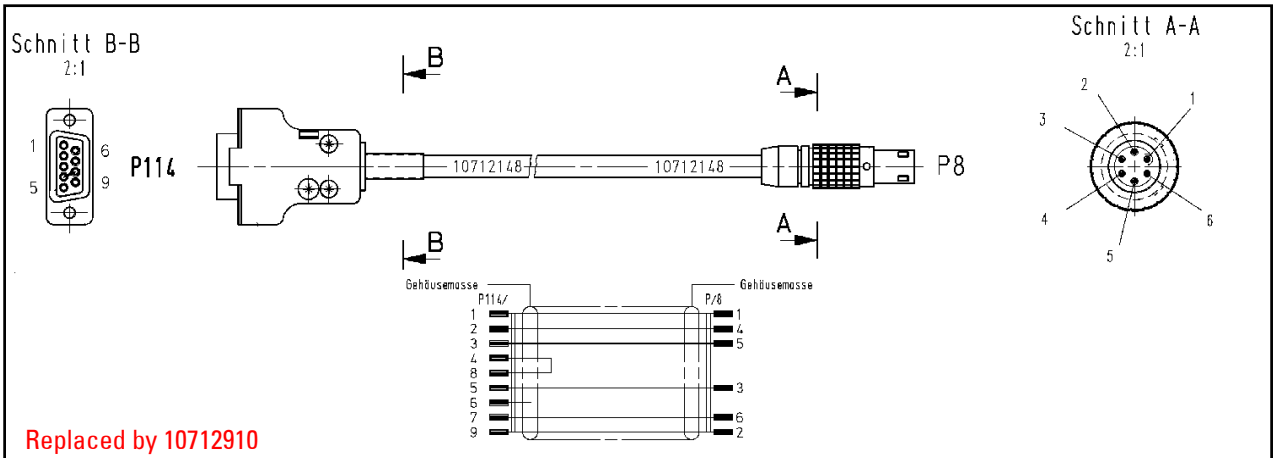
Stock n°.	Description / Specification	Remark	Drawing



10 714 364 CAN cable optics carrier M525 to OH4 stand



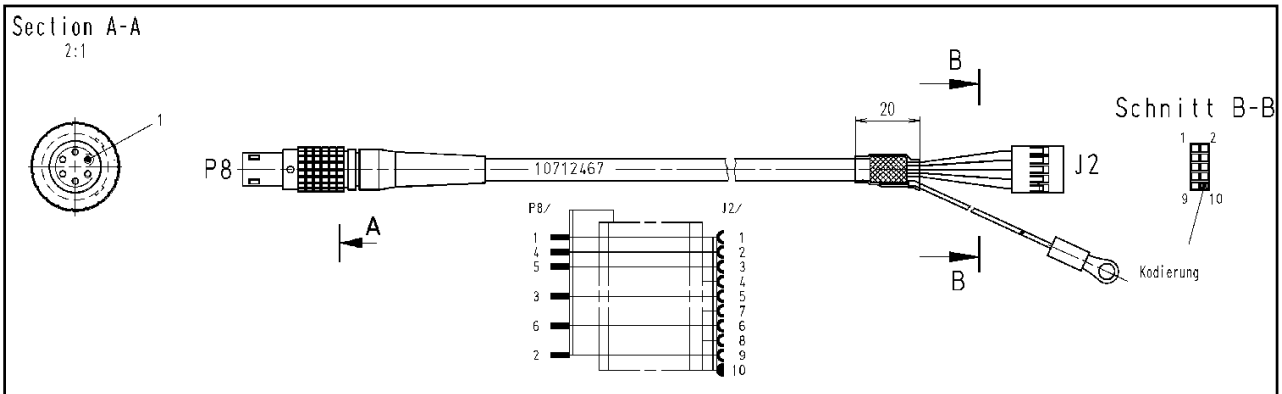
10 712 910 CAN cable swing carrier to optics carrier length = 1000mm



Replaced by 10712910

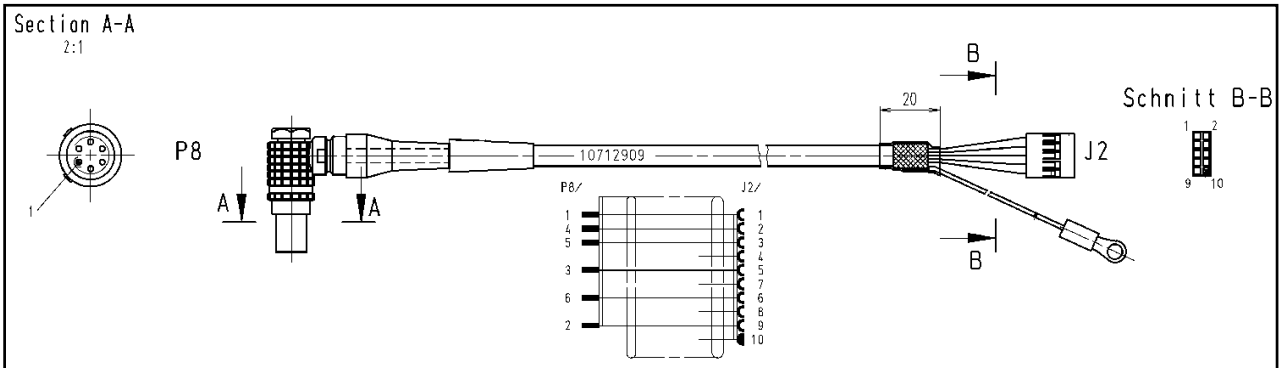
~~10 712 148~~ CAN cable swing carrier to optics carrier length = 1000mm

Stock n°	Description / Specification	Remark	Drawing

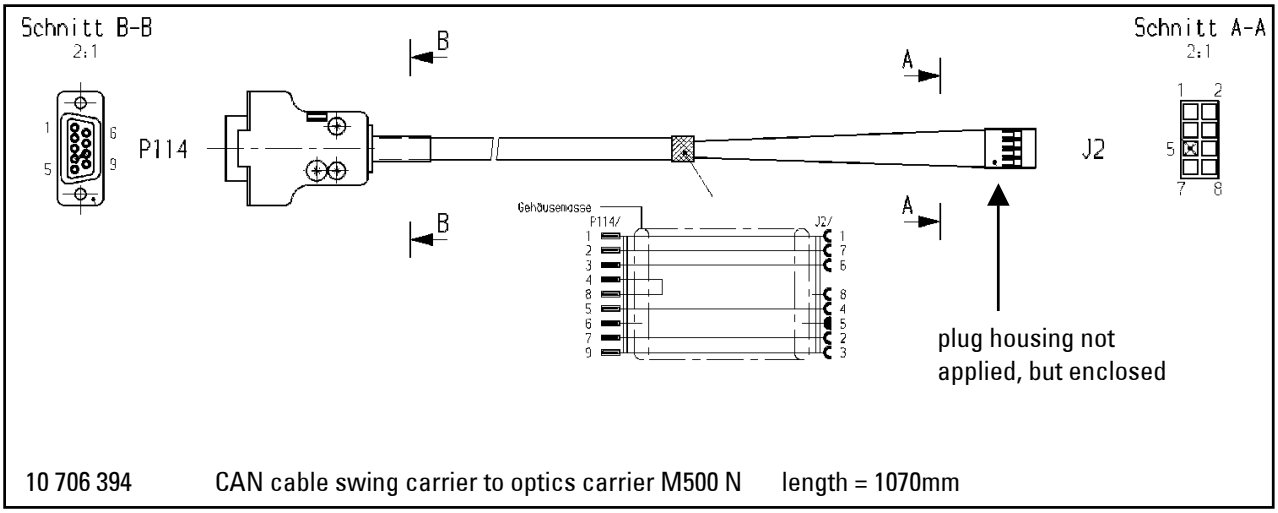


Replaced by 10712909

~~10 712 467~~ CAN cable optics carrier M520 to OH3 length = 5200mm



10 712 909 CAN cable optics carrier M520 to OH3 length = 5200mm



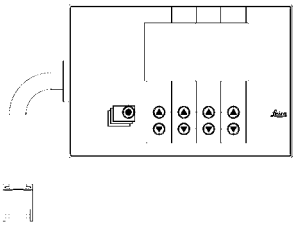
10 706 394 CAN cable swing carrier to optics carrier M500 N length = 1070mm

Stock n°.	Description / Specification	Remark	Drawing

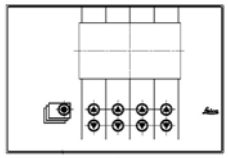
Control unit

Control unit exchange modules

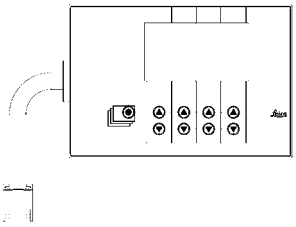
10 446 489R With power supply for former MC1 systems till 03/2005
(10446489 corresponds to 10448144MO)



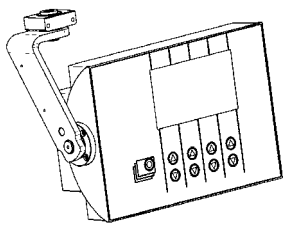
10 711 851R For OH3, without holder; SW 1.87 or higher without power supply



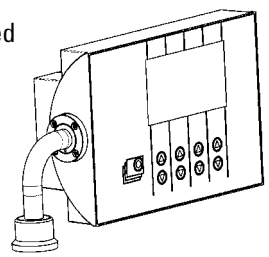
10 448 144R For MS3 and MC1 after 03/2005 ; SW 1.87 or higher
fits also to: MS1, MS2, OHS1



10 448 068R Control unit for F40



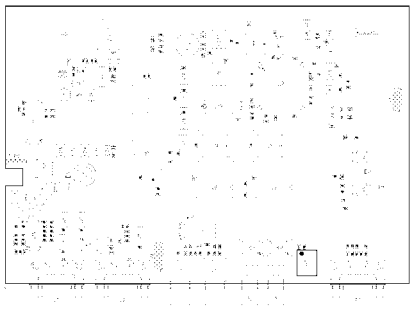
10 448 169R Control unit for C, CT40 left and right mount carrier also included



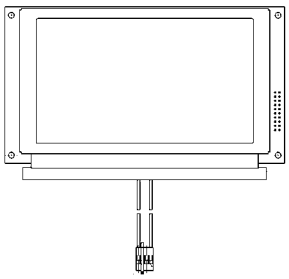
Stock n°	Description / Specification	Remark	Drawing

Components control unit

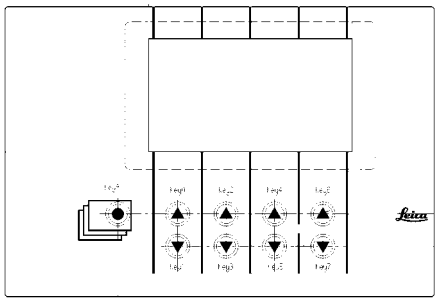
10 661 330 Control module with SW 1.87 or higher



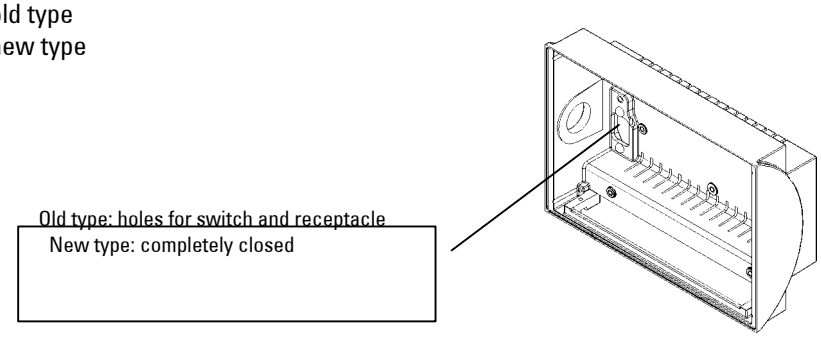
10 706 177 LCD module



10 705 572 Switch panel: complete front plate with keys and window

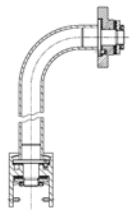


10 706 051MO Housing for control unit old type
10 713 286 Housing for control unit new type

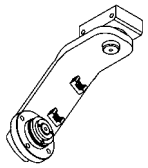


Stock n°.	Description / Specification	Remark	Drawing

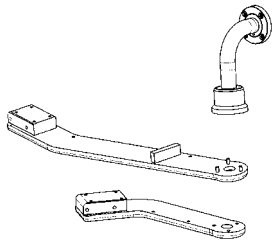
10 706 174 Holder complete



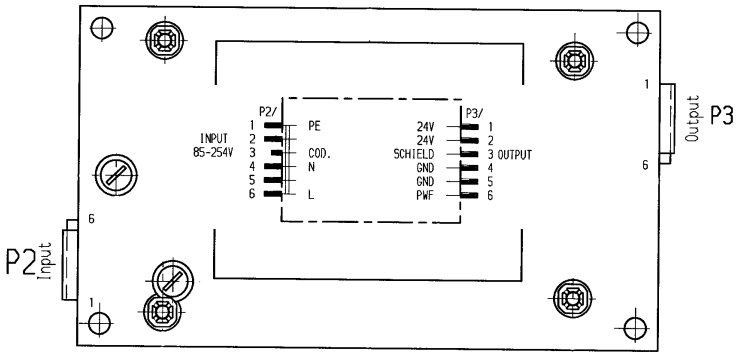
10 712 301 Holder complete for F40 delivery time on request



10 713 573 Holder complete for C40/CT40 delivery time on request



10 560 480 Power supply (only required if control unit is used in MC1 stand systems till March 2005)



10 426 032 Power switch (only required if control unit is used in MC1 stand systems till March 2005)

Stock n°	Description / Specification	Remark	Drawing

Upgrades, upgrade tools

10 714 461 Upgrade kit M520 to M525

Available for limited time only.
Existing M520 optics carrier can be updated with the auto-iris function. Find more information in the upgrade description: doc code 10 665 743.

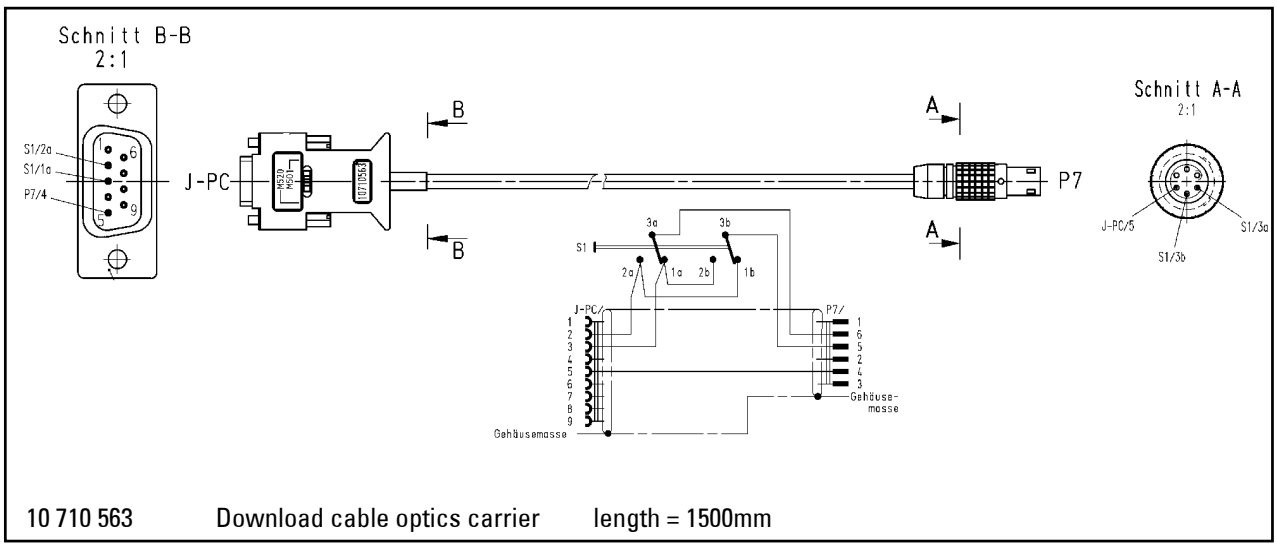
10 711 827 Upgrade set system SW

consists of 4 Eproms and instruction:

- 10 711 685 Eprom U4 control unit, contains SW 1.87 or higher
- 10 711 686 Eprom U5 control unit, contains SW 1.87 or higher
- 10 711 684 Eprom M500N/M520 optics carrier, contains SW 2.4 or higher
- 10 711 655 Eprom U19 base module, contains SW 2.51 or higher; for old base module
- 10 665 675 OHS1_MS1_MS2 Software update instruction

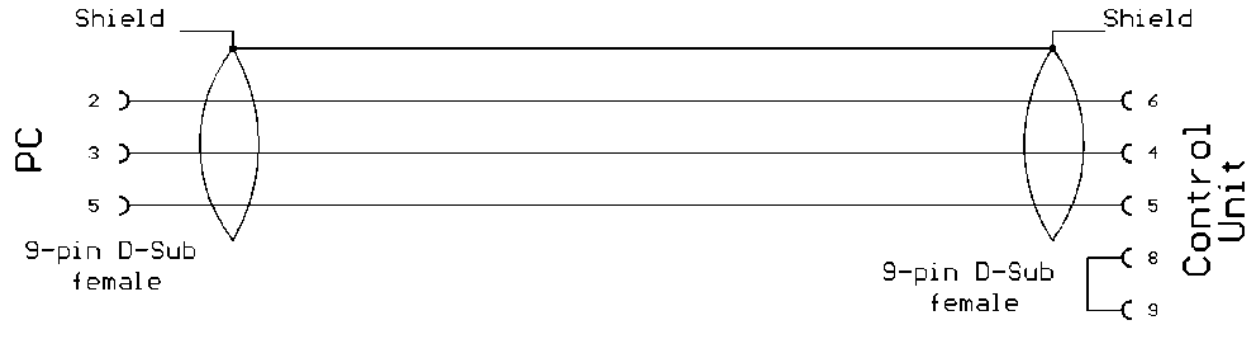
10 712 463 Update CD

Contains latest SW versions, download programs and update instruction. The CD, together with below update cables, allow updating the optics carrier or the control unit via Laptop/PC.



10 710 563 Download cable optics carrier length = 1500mm

Stock n°.	Description / Specification	Remark	Drawing



10 710 562	Download cable for control unit	length = 1500mm

Stock n°	Description / Specification	Remark	Drawing